**Working Animal Management**

**1-Introduction**

According to evolutionary information human being started farming around 12,000 and wheat cultivation 9000 years ago. Dog was the first domesticated animal around 14,000 years ago followed by sheep and fowls 11,000 and 2,000 years respectively. Animal power for transport and cultivation has been used in Africa for over 5000 years. The employment of domestic animals for tillage or transport is known as animal traction. The term is generally understood to include **pack** transport as well as the ‘**pulling**’ work of animals. In various parts of the world cattle, buffaloes, yaks, horses, donkeys, mules, camels, llamas, elephants, reindeer, goats and dogs are used for transport, crop cultivation, water-raising, milling, logging and land excavation or levelling. Cattle are the major work animals world-wide. It is most common to use male animals because they are stronger than females and cattle herds always produce a surplus of males. Castrated animals are more docile than intact males. Thus, the most common working cattle are castrated bulls, known as oxen or bullocks. In some texts, the word oxen has been used to describe any working cattle. Since working cattle are generally castrated males, the two uses of the word generally overlap. Nevertheless, confusion can occur in regions where cows or bulls are used for work. In this text, an ox is a castrated bull of any breed that is used for work. The term bovid encompasses the animals that are closely related to cattle, including water buffaloes and yaks. After cattle, the main work animals world-wide are horses, donkeys (asses) and mules, known collectively as equids. In current English, a domestic ass is generally called a donkey. The word ass is now mainly confined to archaic, zoological or colloquial writings (and the statistics published by the Food and Agriculture Organisation). Mules are non-breeding hybrid animals formed by crossing a female horse with a male donkey. They are stronger than donkeys and more hardy than horses. The other possible cross (female donkey and male horse) is known as a hinny. These are much less common, partly because the cross is biologically much more

difficult to produce.

 Animal traction has been an integral part of farming systems in north Africa and Ethiopia for at least two millennia. The use of animals for riding and pack transport has a long history in many parts of Africa, although details of its origins and spread are not well understood. The use of animal power for wheeled transport and soil tillage does not appear to have spread in sub-Saharan Africa, prior to the ‘contact’ and colonial periods. In the past five hundred years, the use of animal-power for wheeled transport spread slowly from ports and colonial bases. The animal drawn plow was introduced into South Africa by colonists in the seventeenth century, and it spread slowly to neighboring territories. In most other sub-Saharan countries, it was introduced in the twentieth century by colonial authorities wishing to increase agricultural production. In most villages in Africa, animal-drawn plows were introduced in living memory. Many successful colonial and post-independence promotional schemes involved the provision of implements, training, credit and marketing channels. In circumstances where implements were readily available through private-sector traders, animal traction sometimes spread without any promotional schemes. Following the introduction of animal traction technology, many innovations were developed and spread through informal farmer-to-farmer processes. At the end of the twentieth century, animal traction was still spreading in most of sub-Saharan Africa, and appeared likely to continue to increase in the foreseeable future.

As the twentieth century ends and the twenty-first begins, the historical processes continue, and animal traction in Africa continues to spread and to evolve. There are still many areas where animal traction is absent from farming systems. In certain mountainous regions, forest zones, very arid areas or where the animal disease challenge is high, animal power may never be considered appropriate. However, at the margins of these areas, animal traction is likely to spread. The adoption of the technology in new areas is likely to result from farmer migration, farmer-to-farmer contact and the activities of development programmes.

**Neolithic Age (8000-5000 BC):** During this era early farming tools were made up of stone and wood.

* Stone adz – used for wood working
* Sickle or reaping knife- used to gather grain.
* The digging stick- used to plant seeds
* Spade or hoe –used to plant seeds
* Tree branch- scratch the surface of the soil for planting

**Agriculture (from 2500 BC to 500 AD):** Historical agriculture shows that metal work was started during this period. So far mankind used three systems of energy for agricultural activities.

* Farmer—manual farm tools

 \_ Farmer—animal traction

* Farmer—machinery ( mechanized)

In developed countries the first two systems have almost disappeared and activities are performed using machineries.

In developing countries the case is different. Most of them are used manual farm tools and animals.

* Above 80% uses manual farm tools
* 15% animal traction
* 5% machineries

However, the world population growing rapidly, especially in the poor countries. Population growth in undeveloped countries is above 3 %. This newly added population needs foods security.

To feed the human population, poor countries have two alternatives:

1. Introduction of farm mechanization. But this needs
* Capital for the purchase of machineries
* Skill ( especially for maintenance)
* Appropriate land size and topography ( most machineries can effectively be used on level grounds and on bigger land size).
* Running cost of machineries (fuel, lubrication, etc. ).

Mechanization can be used by making available through rent, but only addresses a very small proportion of total farmers.

**2. Improved use of draft animals**

 Use of animals for agricultural purposes bring sustainable development for various reasons.

* The highest animal population is found in poor countries (cattle, buffalo, asses, horses). This is a good point of entry for integration of livestock and crop production.
* Use of draft animal is relatively inexpensive
* They can be managed within the resource limit of the rural poor.

Feed mainly roughages including crop residues

Produce traction, meat, manure

**Constraints:**

Efficient utilization of draft animals require

* Suitable farm implements
* Appropriate harnessing systems
* Appropriate feeding and handling
* Employing the right animal for the purpose ( selection)
* Management of health problems

**Species of draft animals**

**A - Bovidae family**

Cloven footed ruminants, by the presence of unbranched hollow horns that are never shed and continue to grow throughout life.

e.g. Antelope, sheep, cattle, goat, bison (large humped animal resembling ox).

 **Cattle**

Species………. *Bos indicus*: tropical cattle usually humped

 *Bos Taurus*: temperate cattle, not humped

Ethiopia has mainly *Bos indicus* type of cattle There are 23 recognized indigenous breeds type present *.*

**Table 1. Ethiopian breed of cattle**

|  |  |
| --- | --- |
|  **Breed group** | **Representative breeds** |
| **Small East African Zebu (12)** | **Adawa , Guraghe, Smada** |
| **Sanga (4)** | **Anuak, Danakil, Raya-Azebo** |
| **Large East African Zebu (3)** | **Arsi, Boran** |
| **Zenga (3)** | **Arado, Fogera, Horro** |
| **Humpless short horn** | **Sheko (around mizan)** |

Cattle are very important source of power for tillage. This can be explained by the number of male animals in the country.

* Agricultural land is fragmented and can be ploughed using animals. Many places cattle are used for tillage practices.

 **Equidae**

Species…………*Equus asinus* (donkey)

 *Equus caballus* (horse)

**Donkey**

Dictionary meaning**:**

1. Animal resembling small horse; 2. Unintelligent person
* Ascend mountains, travel narrow paths.

- Tolerant to water deprivation next to camel

* **Characteristics**
* Compact frame, and hardy ideal for work animal
* Height at withers, 90 -115 cm
* Weight, 100 – 150 Kg
* Has a mane of short stiff hairs
* Domesticated ass known for its big ears and loud braying sound
* Has a brownish grey coat with black strips down the back and across the shoulders

**Domestication:**

* It is believed that all domestic donkeys in the world are descended from African wild ass.
* Nubian wild ass : *Equus asinus Africans*
* Somali wild ass : *Equus asinus somalicus*
* Asian wild ass : *Equus asinus hemoinus*

- Donkeys are believed to have been domesticated around 5000 years BC in Northwest Africa. The true ass (*E. asinus*) was originally domesticated in the Nile valley civilizations. Donkeys were used to carry loads and people in Egypt 3000 years BC.

- The true home donkey is the arid and semi arid areas of north east Africa and western Africa.

In Ethiopia donkeys are distributed in almost all agro ecologies because of their peculiar physiological advantage to adopt the lowland areas.

Others: Iran, Egypt, India, Afghanistan, Nigeria.

**Donkey types in Ethiopia**

Not sufficient work has been done to classify our donkey. Based on preliminary observation they are grouped into Jimma type

Abyssinian type

 Ogadene type

 Sennar type

 **Uses**

Packing, draught power, riding

Milk and blood (Massi and Turkana pastoralists, Mongolians)

Meat (Nigeria and part of Europe)

**Horse**

* Domesticated 6000 yrs. ago in the steppe area of Russia and Ukraine.
* Wild ancestor: *Prezwalski* horse
* No other animal played a special role in the acceleration of social progresses and political developments as the horse
* The rise and fall of empires
* The great battles of world performed on horse’s back
* Development of transport system (Wagons)
* Development of mailing system
* Involved in agricultural progress (pulling of plows) & Developments of different sports.

 **General Characteristics**

* Horse is large land mammal notable for its speed, strength and endurance. These are the important traits make them useful for domestication.
* Horses display a remarkable variation in size, body shape and coat color.
* Muzzle is long – provides enough distance between the horse’s mouth and its eyes so that it can graze and watch for danger at the same time.
* Has the largest eyes of any land mammal. The large eye protrude from the sides of the head of the head enabling the horses to see almost directly behind themselves.
* Have long elongated but light leg.

-Long: produce long stride (step, pace)

-Light: allows the horse to swing its limbs back and forth minimal expenditure of energy.

* Horses are intensely social animal, forming strong associations with members of the herd and possessing a keen ability to recognize social cues.

**Type of Horses**

**Hot Blood (light) horses**

* Have small bones and thin legs
* Most of these horses weight less than
* Measure 15 to 16.2 hh

Height of the horse is measured in hands high (hh) from the ground to the highest point of the withers. A hand equals to 4 inches (the average width of man’s hand).

* Are mainly saddle horses that used for pleasure riding, rounding up or cutting cattle in the field for racing.

Example

The American saddle horse, the Tennessee walking horse, the Morgan

The Quatar horse, the Arabian horse the thoroughbred

 The standard bred (American trotting horses)

**Heavy (draft ) horses**

* Are cold blooded, heavy draft horse
* Larger, gentle horses for working or hauling
* Have large bones and thick sturdy legs
* Weigh more than 2000 pounds (900Kg)
* Measure 20 hh
* Used to pull plows, wagons, coaches, artillery
* Not important after world war II
* Example: Shire, Belgian

**Ponies**

* Are small horses.
* Most ponies weigh less than 800 pounds (350 Kg)
* Measure less than 14.2 hh
* Good pet for children
* They make good mounts for pleasure riding
* Ponies have a reputation for being smart and wily (skilled at using clever tricks to deceive people)
* Breeds include : Shetland, Welsh

**Mule:**

* Mule is an offspring of mare (64 chromosomes) and a jack ass (62 chromosomes). Hence it has 31 pairs of chromosomes.
* Mule is infertile animal.
* Many pairs chromosomes are unevenly matched (not homologous; the number of chromosomes in horses and donkeys are different).
* Structural differences- horse and donkey chromosomes have developed slightly differently over evolutionary time and are almost completely unable to pair up at meiosis to produce a viable sperm and egg.
* She is hybrid and as a result has got the following advantages.
* Lives longer: can endure more work and hardship, less prone to digestive disorders, lameness and disease than the horse.
* She covers from work more quickly overnight than the horse; she is hardest of all pack animals and least to develop back and saddle sores.
* Mule excel both its parents in sagacity, muscular endurance, sure footedness, and length of life.

**Hinny :** Hinny is a hybrid of animal that resembles a small horse. She is produced by the mating of a stallion with a female ass (Jenny).

* Small in size probably mothering effect.
* Has similar inheritance like mule in terms of fertility.
* Considered as not useful because of their size and lack of stamina.
* Distribution is limited to such countries as Greece, West Nepal, India.

**Camelidae:** Camels play a central role in providing draught power and determining the wealth and social status of pastoralists. Camels are of two types breed , one - humped camel or Dromedary , and two – humped Bactrian breed.

* Dromedary breeds for draught power specially in arid areas of Western Asia.
* The Bactrian or two - humped is generally a long haired sturdy animal powerfully built and adapted to rigorous cold climates. There are about 20 million camels in the world. In Africa 15 million found, while 12 million in Northeast Africa , 3.11 million in North and West Africa, 5Million in Asia( FAO, 2009).

**Effects of work on physiology and metabolism**

* Exercise and work have many effects on physiological and metabolic functions. The consequences include short-term stress, increased metabolic rate (short-term), increased energy and nutrient requirements and changes in the ratio of blood metabolites characterised by a drain on blood glucose and acetate, the depletion of glycogen reserves and the stimulation of free fatty acid mobilisation. The replacement of body stores after work is associated with short-term increase in metabolic rate. It has been shown that the metabolic rate of animals after work remains high until reserves of glycogen and energy yielding metabolites such as free fatty acids and tryglycerides have been replaced (Lawrence et al. 1989). Nutrient requirements will be increased as a result. When animals work they become fitter. This involves increased cardiovascular rate, increased muscle tone, changes in lean to body fat ratio, effects on digestive function and reduced long-term metabolic rate. As they become fitter and better co-ordinated they use less energy, which can partly offset the increased metabolic rate discussed above.

**The effect of work on the health of draught animals**

* Draught cattle suffer the normal health problems of other cattle Work also may have direct effects on health, some beneficial and some detrimental.
* Stress, caused by poor husbandry or overwork, can pre-dispose to other health problems. In untrained animals, stress is characterised by increased body temperature, increased respiration rate, fatigue and energy expenditure to maintain homeostasis.
* Evidence from Nepal (Pearson, personal communication) has suggested that work precipitates latent helminth infections in draught buffaloes, which reduced their work output significantly..

**The effect of work on food intake**

* On roughage diets, intake is related to the amount of digesta in the reticulo-rumen and the rate of passage through the tract. For diets containing more concentrate, intake is limited by other factors including thermostatic and chemostatic regulation. Ruminants can adjust intake to meet requirements in a similar way to monogastric animals, provided the physical and chemical properties of the food do not impose limitations (Forbes 1983). Hence the animal's current Physiological state plays a part in determining food intake Work increases food intake in horses and rats (Weston 1985), and it might be supposed that work also increases food intake in ruminants. This has been investigated by a number of researchers.
* The nutrient demands of lactating cows permit these animals to eat 35-50% more than non-lactating animals of the same weight and on the same diet (ARC 1980). This factor could be exploited if cows are used for draught purposes. .

**The effect of work on digestion**

* In working buffaloes it has been reported increases in digestibility (13%, 6% and 12 % respectively). Light exercise may be beneficial causing greater mixing of the rumen contents which may enhance microbial fermentation. Higher levels of work might have more detrimental effects, caused by a shift in blood supply from the gut to muscles and peripheral tissues.

**The effect of work on bodyweight change**

* Observations have indicated that well-fed animals increased in body weight at the start of a working period as fat was being replaced by muscle tissue.
* The loss of weight should not necessarily be regarded as a bad consequence. If the animals are able to regain their weight within a reasonable period 'working off their beck' could well improve their overall efficiency. However, this only applies to animals which are in relatively good condition at the start of the working period

**The effect of work on the productivity of draught cows**

a) **Lactation**

* Glucose has been identified as a nutrient which may act as a constraint on work or other productive functions in ruminants (Len, 1985). Glucose is not usually an end-product of digestion in ruminants and little glucose is absorbed from the gut. Sugars ingested into the rumen are quickly broken down by microbes and ruminants derive most of their glucose from precursors such as propionate and amino acids. Propionate production is encouraged by feeding diets with a greater proportion of concentrate, rather than roughage diets which promote acetate as the end product of fermentation. Leng (1985) suggests that glucose availability may constrain work, particularly in growing animals or productive females. This may be true despite the animal's ability to synthesise glucose at differential rates according to productive function.
* Glucose is essential for lactose synthesis and for certain other functions. The rate of milk secretion is related to the osmotic properties of lactose and is proportional to the rate of secret on of lactose (Rook and Hopwood 1970; Rook and Wood 1959).
* A number of authors have stated that if cows are well-fed work will have no effect on milk yield Research on European dual purpose breeds showed no drop in milk yield in cows in good condition (Krautforst 1947).
* Although milk yield declines during exercise, yields have been shown to return to previous levels when animals are rested for 2 days after 5 days of exercise (Matthewman et al. 1989).
* Diet may influence the response to exercise at ILCA suggests that working crossbred cows receiving concentrate supplements show better milk production persistency then non- supplemented animals..
* b) **Reproductive Physiology**
* Work carried out in early lactation could delay return to oestrus and reduced blood sugar levels resulting from work could affect implantation if work was carried out around this time.
* A study conducted by ILCA (Agyemang et al. 1985) on the effect of work on productive and reproductive performance of crossbred dairy cows in the Ethiopian highlands indicates that work had no significant effect on milk production, lactation length, days open, calving interval and services per conception when animals received adequate feeding and only worked for short periods.

**The Husbandry of Draught Animals**

* Much draught animal husbandry and management is the same as for other animals, but there are special features which include the following:
* draught animals have to be able to work when they might be least able to do so (i.e. at the end of dry season)
* husbandry practices (e.g. vaccinations, mating of draught cows) will have to be timed in conjunction with work requirements
* work can cause stress and predispose to further health problems
* draught animals are therefore more vulnerable to illness
* veterinary care will be required at specific times
* some specific health hazards of work
* good foot care is required
* draught animals need to be easily handled and used to human beings
* draught animal husbandry requires a greater labour input (for feeding, cut and carry)
* draught cow nutrition is more complex than for oxen
* draught animals may suffer heat stress.

**Seasonal use of draught animals**

* A regular routine of work should be maintained outside the cultivation period. Draught animals should be used for carting in the dry season, rather then regrouping them with the grazing herds as is common in West Africa. This will keep them trained and reduce stress at the start of the new growing season. Draught cows have the advantage that if they are regularly milked' this contact will help to keep them tractable. Farmers, however, might consider the maintenance of such a routine an unnecessary demand on their time and effort. The positive impact of increased effort on family income needs to be demonstrated.

**Duration of work**

* The amount of work expected from an animal should be determined by the food input, the condition of the animal and stage of lactation and pregnancy in females. If necessary, animals should not be worked every day, but the more work that an animal performs, the more efficient it is.

**Housing**

* Because of their value, draught animals offer one of the best ways of introducing improved animal husbandry methods to local farmers. A simple shelter or lean-to would provide the necessary protection from rain. Shelters should have a sloping floor to allow run-off to keep them dry and clean, and dung should be removed daily to reduce the problem of flies. Good hygiene is essential and more harm than good can be caused by allowing houses or shelters to become dirty. Houses should be periodically disinfected and clean bedding provided. Troughs for food and water should be provided.

**Health care of draught animals**

* Pearson (1986) makes the important point that little benefit will be gained from better feeding, training and improved harnessing and implement design if health is neglected. Care is required to prevent stress and subsequent loss of health to ensure the animal can carry out timely work.
* Draught animal husbandry should be as stress-free as possible. If animals are handled frequently, stress caused by contact with human beings will be negligible. Animals should be groomed (washed and brushed) and inspected daily for wounds, skin infections, signs of harness-rubbing and ticks. Hooves should be inspected and trimmed as necessary.
* Prior to the main cultivation season, attention should be given to health and condition to ensure that animals will be able to complete the work necessary. Since stress can arise because of poor nutrition, attention at this time to building up body condition is important.
* Good vaccines are available against **rinderpest,** **anthrax**, **black quarter**, **contagious bovine pleuro-pneumonia, haemorrhagic septicaemia, pasteurellosis and tetanus**, and drugs are available for protection against trypanosomiasis. It should be borne in mind that vaccinations should be given at a time that work stress does not interfere with the immune response. Animals should be tested for tuberculosis, brucellosis, trypanosomes, piroplasmosis, Johne's disease and helminths. Cattle can be sprayed strategically against ticks using handsprays or washing. Routine drenching against roundworms and flukes is recommended, particularly where animals are working in wetter areas.
* Ectoparasites such as lice can be treated with insecticides. Brushes should also be treated to stop the spread of mange. Ringworm, which is more common in younger animals, can be treated with tincture of iodine daily on the lesions. Wounds and scratches can predispose to other infections such as streptothricosis and should be washed and disinfected. Healing ointment will help protect the wound and keep flies off.
* Proper nose rings should be used rather than rope to reduce irritation and laceration of the nasal septum. Horn injuries from tight ropes end neck and shoulder injuries from harnesses can easily be avoided by careful attention to harnessing methods. Ropes and harnesses should be disinfected regularly. Attention should be given to the possible dangers end causes of lameness in the locality where animals work or graze. Stones and earth can become stuck in the hoof, as well as thorns and other sharp objects. Strains and sprains need complete rest.

**Feeding draught animals**

* The nutrient requirements of draught animals is the main energy metabolites which supply working muscles are acetate, free fatty acids and glucose. Acetate is the main energy substrate for resting muscle, but when animals work, free fatty acids become more important and glucose utilisation is increased Other sources of energy for muscular work include glycerol and the glycogen present in body tissues. In mature oxen, requirements for work would only compete with maintenance for metabolites, but in lactating and/or pregnant cattle greater competition for metabolites could occur.
* Natural vegetation will provide such requirements only at certain times of the year. Work done in the Ethiopian highlands indicates that the energy content of dry roughages range from 6 to 7 MJME/kg. In addition most mature dry and green forages are found deficient in phosphorus and sodium (Bediye and Sileshi 1989). The types of food available for draught animals in West Africa include natural pasture (young, mature, senescent or standing hay), browse and tree leaves, fruits of trees (e.g. *Acacia albida* and *A*. *tortilis* pods) crop residues, agro-industrial by-products, concentrates from crops such as cotton and groundnuts, grain millings, bloodmeal, fishmeal, cereal grains, urea, molasses, salt and mineral supplements. Conserved roughages such as hay and silage are not commonly used in many parts of the tropics. Hence, application of new techniques and research findings to conserve part of the abundance of natural forage during particular periods of the year needs further attention (for example, roughage treatment with alkalis such as sodium hydroxide or ammonium hydroxide derived from urea to improve the nutritive value of poor quality roughages.)
* Draught animals are most called upon at the beginning of the wet season when food resources are poor. Strategic 'work flushing' one month before the start of this period would reduce the problems normally encountered.
* The timing of feeding during the day and the number of feeds when animals are working should allow the animal to consume as much food as possible. The better the quality the diet, the better the intake.
* It is important to weigh animals regularly so that food provision can be adjusted to requirements. Weighbands which measure the heart girth are a good alternative to weighing, but should be calibrated for the particular breed. Condition score is a useful way of gauging the animal's nutritional status.
* Application of the knowledge gained to an African farmers' situation will often be obstructed by a lack of resources. With reference to the prevailing climatic conditions, one could' however, draw up a husbandry calendar based on the food energy requirements.
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