

# Two

## Role of Draught Animals

Agricultural production in the mountains needs to increase substantially, and it should be sustainable. Increased demands as a result of population growth and the rising standards of living are only one end of the scale; at the other is the need to overcome malnutrition and poverty. This will require adequate energy and its sustainable use; and this does not exclude manual farming, nor does it mean that farm mechanisation is the only way out to meet energy demands. Manual operations will continue to be an essential input for development of sustainable agriculture, and mechanisation is not a sound basis for agricultural progress in the mountains.

A primitive energy system involving draught animals still exists in the mountains, and this system, complemented with manual operations, can become part of an ecologically-sound, environmentally friendly, and mountain-specific approach to sustainable and increased production in the region. Draught animals are the most economical and readily available source of energy in rural mountain areas.

To understand the vital role of draught animals, it is imperative to examine various energy sources, advantages of draught animal-based energy systems (and the disadvantages of farm mechanisation), and multiple uses of draught animals. This is examined in the following sections in the specific mountain context. The vital role of draught animals has been quantified in a separate chapter.

### **2.1 Energy Systems in Mountain Agriculture**

Three basic energy systems are used globally: (i) manual farming tools, (ii) draught animal power, and (iii) mechanised systems. In fact, these energy systems, barring in some marginal areas, are usually found side by side, although they vary in distribution and relative importance (Bodet 1987). In some regions, mainly characterised by marginality, fragility, inaccessibility and diversity, for example the Himalayas, there is virtually no scope for the development of fossil fuel-powered, machine-based energy systems. Almost all agricultural production in such regions relies solely on manual farming tools and draught animal power systems, or animate energy systems.

Experience shows that there is a direct relation between the level of energy used, whether human, animal, or fossil, and the level of production per unit of land. In fossil energy-

driven systems, the relatively high energy use explains the relatively high productivity. However, there are organic, integrated systems in which virtually no fossil energy is used, that, in terms of overall production, are at least as productive as modern systems but which have a less negative impact on the environment and may be socially more acceptable (Durno et al. 1992).

That the source of energy is not important for the level of production is also demonstrated by comparative research in the Philippines (Kuether and Duff 1981) where it was found that the same yield of rice could be obtained from mechanical, transitional, and traditional farms. Basing policies on comparative energy balances only, therefore, can lead to wrong decisions if these data are not combined with information on, e.g., production, availability, cost, impact on environment, gender, and the community as a whole (Reijntjes 1992).

Agricultural/cropping transformation and mechanisation often go hand in hand. But, in this respect too, mountains are the exception. Almost complete transformation in some favourable pockets of the mountains, it has been experienced, has not invited mechanisation to any degree. In transitional areas, e.g., the Shivalik and foothill range where a handful of farmers occasionally hire tractors for ploughing, limited use of fossil fuel energy is visible, and this is because there is even land which is easily accessible and well-linked to the plains.

Energy systems used for agricultural work in the mountains exist as an integrated system. A system using farming tools can exist independently; and, to a great extent, so can a mechanised system. But the draught animal power system can never exist independently. When, through the use of an implement, an agricultural operation absorbs an animal's energy, it will simultaneously absorb human energy. So both systems (animal power being dominant) are inseparably integrated. Use of a mixture of energy technologies in crop production is referred to as an integrated energy system. For agricultural work we can call it an 'animate energy system' since the energy is produced by a living system. Fossil-fuel energy, on the contrary, can be referred to as a non-animate source of energy. The former is renewable, the latter non-renewable. In this text, unless specified, the word 'energy' refers to the energy used for agricultural work, e.g., tillage, weeding, puddling, threshing and so on.

## **2.2 Animal vs. Farm Mechanisation**

Draught animal power is obviously the most suited to mountain agriculture. A number of sound reasons why it is preferable to fossil-fuel power can be found in the literature (Gill 1981, Bhalla and Chadha 1982, Nair 1982, Ramaswamy 1983, Bodet 1987, Singh and Naik 1987a and Reijntjes 1992).

- The source of energy already exists in the region. DAP does not have to be manufactured or bought at a high cost.

- The use of animals increases a farmer's 'work force'. It enables the farmer to plant diverse crop species to increase the area cultivated and to carry out agricultural work in time.
- Machine-based energy results in the concentration of production on a limited number of crops, thus reducing the diversity of the system.
- Animal-drawn implements are cheaper than mechanised equipment. Animal-drawn implements can be made locally and are more suitable for the small, often fragmented and scattered, mountain farms.
- Draught power does not need expensive and non-renewable fuels. Draught animals can also be fed residues and by-products available on the farm, producing, in return, not only energy but food (milk from the female cattle), methane (biogas), manure as well as other products obtainable after their death.
- The use of draught animals enables farmers to integrate livestock and crop production and permits the exploitation of the potential of cattle kept on settled, subsistence farms.
- Mechanisation causes direct labour displacement in land preparation. If it does not also contribute directly to increasing cropping intensities and yields, or to facilitating a switch to more labour-intensive crops, there will be a net loss of employment opportunity in areas where alternative sources of income are scarce.
- Fossil energy used in machines is a finite resource and its use has a considerable negative impact on the environment. Most farmers in the mountains cannot afford fossil energy-based technology.
- Where animals are used as draught power, it is possible for farmers to either cultivate more land or use the time for other activities.

The above-listed arguments clearly reveal DAP's supremacy over mechanisation. In the mountain areas, owing to specific resource base characteristics altogether different from those of the plains, improvement in the efficiency and sustainable use of the system are essential.

### **2.3 The Primary and Secondary Roles of Draught Animals**

In addition to providing draught power for agriculture, draught animals play many other roles in the mountain farming system; these can be referred to as their secondary roles. Primary roles include ploughing or tillage, levelling, puddling, earthing-up, and weeding and threshing.

In the Central Himalayan mountains, unlike in the plains, draught animals are not used for tillage or for operating water-wheels. Table 2.1 gives a broad picture of their contributions to the mountain economy in comparison with other livestock species.

Draught animals perform several secondary functions also. These range from direct, visible contributions, in terms of supplying physical items such as dung and milk, to less

**Table 2.1: Contribution of Draught Animals and Other Livestock Species to Mountain Farming**

Contributions	Draught Cattle		Buffaloes	Goats	Sheep	Pack Animals
	Male	Female				
<b>Agricultural Operations</b>						
Ploughing	✓					
Levelling	✓					
Puddling	✓					
Weeding, Earthing-up	✓					
Threshing	✓	✓				
Loading, Pack-carrying	×					✓
<b>Physical Products</b>						
Dung, Manure	✓	✓	✓	✓	✓	✓
Milk		✓	✓			
Meat				✓	✓	
Wool					✓	
<b>Income/Employment Gains</b>						
Direct Productivity Improvement	✓					
Smaller Gains through Sale	✓			✓	✓	
Larger Gains through Sale	✓	✓	✓			✓
Off-farm Activities	✓					✓
Income through Hiring-out	✓					
<b>Social, Cultural, Ecological Gains</b>						
Cropping Diversification	✓					
<i>In situ</i> Manuring of Fields	✓	✓		✓	✓	
Renewable Energy Supply	✓					
Religious, Ethical Values	✓	✓				
Festivity, Fairs, Rituals	✓	✓				
Social Status, Prestige	✓	✓				
Encouragement of Social Cohesion	✓	✓				
Improving the Sustainability of the Farming System	✓					

× Used only by transhumant societies.

visible gains in terms of employment, income generation, farmers' security and companionship, sustaining livelihoods, and sustainability of the farming system. The secondary roles of draught animals are inseparable from those of almost all other classes of livestock.

Draught power is one of the basic requirements for crop farming in an agricultural system. Notwithstanding the availability of good seeds, fertile soils, irrigation facilities, and a favourable climate, crops cannot be sown and harvested without draught power. Untimely and inadequate supplies of draught energy lead to a decrease in crop production. Several studies (Larson 1962, Allmaras et al. 1967, McColly 1971, Lindstrom et al. 1981, and Benoit and Lindstrom 1987) have demonstrated the direct relationship between tillage and productivity. Draught animal power, in a mountain context, must be regarded as an essential input for improved productivity and sustainability.

The weeding season is characterised by long, heavy working days. These are burdensome, particularly on women. The use of oxen-drawn weeders reduces labour constraints and the drudgery of women (Reoleveld et al. 1995).

In the mountains, the productivity of farming systems depends on the conversion of fodder into manure. In mountain areas, especially at high altitudes, crop residues decompose very slowly. The ruminant digestive system helps speed up nutrient recycling. Ruminants also help transfer the soil nutrients from forest vegetation to croplands, improving the fertility of the agro-ecosystem. The dung produced in the stall is transferred to cultivated land, and this requires a long time, apart from human labour; and due to nutrient loss its quality decreases. *In situ* manuring, i.e., by tethering the animals directly in the fields, is an important strategy developed by mountain farmers over the ages and in which draught animals play a crucial role. During the dry season, cattle (and small ruminants) graze harvested fields left fallow and provide manure directly. The draught animals also provide manure directly to the fields while performing agricultural operations. Results of an experiment (Powell and Ikpe 1992) showed that millet yields in corralled areas (which receive both manure plus urine) were over twice as high as yields where only manure from stall-kept animals had been spread. The residual benefits of urine were also observed. Yields in plots where cattle and sheep had been corralled the previous year were about 1.5 times greater than yields from areas on which manure had been spread by hand.

The only food item derivable from draught species (cattle) in the Central Himalayas is milk, which is obtained from cows in the process of reproduction. Cattle meat is strictly forbidden in the Hindu-dominated Central Himalayas, as also in many other Indian states and in Nepal.

Draught animals provide employment for a great number of people, for whom they are a crucial source of family income. In a fast changing scenario, the DAP system is emerging as an income-generating enterprise for many marginal and small-holders, landless families, and some middlemen. This will be discussed later.

In times of emergency, draught animals can be sold for cash. They are often sold to meet substantial expenses such as weddings, building houses, and higher education for children. Economically poultry are regarded as 'coins' and sheep and goats are 'small bills' (Bayer and Waters-Bayer 1992), but for many villages in the Central Himalayas, particularly those situated in remote areas, draught animals function as 'bullock banks'. In Banali, one of our sample villages, for example, draught animals are the best cash animals. They are an asset and give farmers status, companionship, prestige, and security.

## 2.4 The Sociocultural Role of Bullocks

Draught animals have high cultural value. *Gaudhan* (cattle wealth) dominates the Hindu psyche. Regarding the cow as sacred is not just a sentimental expression, the cow is sacred because it produces bullocks, the source of power and basis of agricultural production. The value of bullocks is reflected in many local festivals. Thanksgiving days are observed to highlight the services they give to society.

In *Chaitra* (April), bullocks are fed *Khichri*, a special mixture of pulses and rice. The *Khichri* is cooked together with leaves of *Ayar* and *Somya* collected from the forest by children. It is brought home and offered to the bullocks. This festival is known as *Ayarkutu* and is celebrated to bring good health to bullocks.

Special 'bullock holidays' are also observed in the region. On *amavasya*, the feast of the new moon, bullocks are not used for agricultural work. On the occasion of all important festivals, bullocks, in addition to special care, are given rest at home. *Chaturbhuj*, a very rare type of bullock, is never yoked to the plough. Persons seeking God's blessings visit Shiva temples with their bullocks and offer to give him a male calf (so that it grows into a sacred bull) if their wishes are fulfilled. Sacred bulls are never used for field work. There is a saying "The head of the family and its bullock must be strong". It means that the health of the head of the family and that of its bullock are the bases for the well-being of the entire family.

This infers that draught animals occupy a prominent position in the farm economy. These are the collective gains that accrue to the whole community rather than to individual households.

Draught animals thus cement the social cohesion of mountain people. All these factors and draught animals' crucial role in productivity, income generation, employment creation, and nutrient cyclic flow management are all pivotal to the sustainability of the farming system.