
Animal Energy in Indian Agriculture - Impact and way forward

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ABSTRACT

Livestock is essential to human civilisation and supplied many needs. Since ancient times, animals have provided food, power, and manure to humans. They helped humanity survive at the time. Domesticated for hunting, the animals were later employed for transportation, farming, and food. Animal energy has been utilised for ploughing, tillage, transporting agricultural produce, etc. Over time, humans developed implements to use animals efficiently. However, with advancement of technology different efficient power sources like engines and electric motors made the agricultural activities easier and less

time consuming. Tractors and power tillers have almost replaced farm animals from agricultural activities. In extremely remote and hilly areas where machinery fail, poor farmers rely solely on animals. Again, small sized agricultural land and topography also affect agricultural machine efficiency. Moreover, machine overuse harms soil microbiology and fertility. In recent times, again people are more concerned about the organic products and organic farming requires animal power and dung as fertilizer. Hence, farmers are returning to old acquaintances for farming. The Indian government has also promoted indigenous cow breeds like Red Sindhi, Sahiwal, Tharparker, and others whose male offspring can be used as animal power. Considering animal ethics and cruelty, animal-friendly equipment must lessen animal pain and be efficient in agricultural activities. Animal-drawn implements developed by agricultural scientists have shown promising outcomes when used instead of machine-operated implements. There is still potential to improve animal-drawn equipment and machines' utility, efficacy, and ease of use.

INTRODUCTION

Indian Agriculture is typically governed by the active participation of small and marginal farmers and their resources. Animal energy is been used since ancient times in agriculture and still used in many pockets of India. The utilization of animal energy has been a crucial factor in the development of human societies, allowing for greater productivity, transportation, and agricultural advancements. Animal energy refers to the use of domesticated animals to perform work in agriculture, including plowing fields, sowing, transporting goods, powering mills and many more. This practice encompasses a wide range of animals, including oxen, horses, donkeys, bullocks, buffaloes and even dogs in many ways. It is pertinent to mention that popularization of modern machinery operated by engines or electricity has reduced the use of animal energy in agricultural practices, but the significance of animal energy in Indian agriculture remains substantial, predominantly in rural and less industrialized areas. Though mechanization in agriculture and use of machines like tractors has made the farming very easy as compared to traditional farming methods using bullock and ox power, financial constraints of poor and marginal farmers compelled them to stick to their conventional animal use in farming. However, with increase in the awareness regarding organic farming, people are again reverted back to use bullocks and animal manure in agricultural practices, which gives hope for a prospective future pertaining to use of animal energy in agriculture in India. An attempt is made to summarize the use of animal power from historical context to current practices, and future projections of animal energy in Indian agriculture.

HISTORY OF ANIMAL DOMESTICATION AND THEIR USE BY HUMAN SOCIETY

The first domesticated animals, used for hunting, protection, and companionship. Dogs helped early humans hunt game and protect their settlements against theft and wild animals. The use of animal energy in Indian agriculture dates back by thousands of years. Ancient texts and archaeological evidence suggest that domesticated animals like oxen, water buffaloes, and camels have been integral to Indian farming practices since the Indus Valley Civilization (c. 3300–1300 BCE). In Neolithic Era Cattle, Sheep, Goats were the source of meat, milk, wool, and hides. Cattle were also used for plowing fields, significantly increasing agricultural productivity,

whereas, Pigs were primarily used for meat. In Bronze age, Oxen were extensively used for plowing and pulling carts. The use of oxen revolutionized agriculture by allowing for the cultivation of larger fields. Donkeys could carry heavy loads over long distances and thus were used as pack animals in arid regions. These animals were primarily used for plowing fields, threshing grain, and transporting goods. Use of horses and camels introduced in Iron age, where horses were used for riding and warfare, horses later became essential for plowing fields and transporting goods. Camels used in trade and transportation across deserts. Throughout Indian history, the dependence on animal energy has been shaped by the country's geographical diversity and varying agricultural practices. In the fertile plains of the Ganges and Yamuna rivers, oxen and water buffaloes were essential for wet rice cultivation, while in the arid regions of Rajasthan, camels were used for plowing and transport. This dependence on animal energy facilitated the cultivation of diverse crops, contributing to the rich agricultural heritage of India.

In the era of industrial revolution, in nineteenth century there was a huge increase in use of machines and thus a sharp decline in use of animal energy was observed. Still, in remote pockets animals were used as before. However, in 20th century invention of tractors and its matching machinery for agriculture and transportation significantly reduced the reliance on animal energy. However, in developing countries, animals like oxen, horses, and donkeys are still used for plowing, transportation, and other labor. However, lately there is a growing interest in sustainable agricultural practices, including the use of animal energy to reduce carbon footprints. In some regions, traditional practices involving animal energy are maintained for cultural, economic, and practical reasons.

ANIMAL ENERGY IN INDIAN AGRICULTURE

Draught animal power has traditionally been the main source of power in Indian agriculture. India is blessed with over 73million draught animals which account for equivalent to 18 million kw. Among the draught animals the bullocks, buffaloes and camels are extensively used for draft purposes, whereas, the horses, mules/donkeys and camels are employed as pack animals. Draught animals are used for agriculture operations like seedbed preparation, sowing, weeding, and harvesting, threshing and post-harvest operations. Small and marginal farmers, who have 80% operational holdings, are the major users of animal power. It is estimated that nearly 60% of the total draft power used in agriculture is still derived from animals. A draft animal can exert about one-tenth (1/10) of its body weight for doing farm work. But for a very short period, it can exert many more times the average force. Power developed by an average pair of bullocks is about 750watts (about 1hp) for usual farm work.

CURRENT PRACTICES

Despite of technological developments in agriculture, animal energy plays a pivotal role in Indian agriculture. As per Indian Council of Agricultural Research (ICAR), over 60% of Indian farmers still depend on animal energy for farming. This dependence is particularly prominent in small and marginal farmers, which constitute the majority of agricultural holdings in India. Bullock and buffaloes are commonly used in farm activities like plowing and sowing. Use of animals in farming operations is very useful to navigate small and uneven landscapes and thus are suitable to the patchy landholdings which is a typical characteristic in Indian agriculture. Additionally, the manure produced by the animals are used as a natural fertilizer, which helps in

augmenting soil fertility. Animals such as bullocks, camels, mithuns, mules, and donkeys are widely used for transporting agricultural produce and inputs. In remote and hilly areas, where mechanized transport is not feasible, animal-drawn carts remain the primary mode of transportation. In many parts of India, animal energy is harnessed for threshing grain and operating traditional irrigation systems like Persian wheels. These practices are crucial for post-harvest processing and ensuring adequate water supply to crops.

ECONOMIC AND ENVIRONMENTAL SIGNIFICANCE

The use of animal energy in farming practices is never the first choice for majority of the farmers. However, the financial and topographical limitations compel the farmers to opt for the animal energy for farming operations. However, it is true that the farming operations with animals are time consuming, labour demanding and needs special attention as well. But, while focusing on organic farming and soil fertility, use of animals are the only option to cultivate. The small and marginal farmers of India cannot afford to buy maintain modern machinery, on the contrary farm animals are relatively affordable and require investment. Their maintenance costs are often lower than those associated with mechanical equipment and normally maintained by the residues of the kitchen and grazing in nearby available forest and grasslands. Moreover, in regions where access to modern machinery is limited, animal energy provides an affordable alternative. The use of animal energy generates employment in rural pockets. Activities such as animal husbandry, cart-making, and maintenance of traditional irrigation systems provide livelihoods for many rural households. Animal energy is a renewable and environmentally friendly source of power. Using animals for agricultural labor reduces carbon emissions compared to using fossil-fuel-powered machinery. Moreover, the use of animal manure as fertilizer reduces the need for chemical inputs, promoting organic farming practices.

CHALLENGES AND FUTURE PROSPECTS

The use of animal power in agriculture has experienced a substantial change with time, but it has a lot of challenge to address as well in coming days. While the benefits of animal energy are clear, there are several huddles that need to be addressed to ensure its continued relevance in Indian agriculture. Animal power is generally less efficient than modern mechanical power. Efforts to improve the efficiency of animal labor through better breeding practices, training, and ergonomically efficient equipment are essential. Research into developing breeds that are more resilient and better suited to various agricultural tasks is ongoing. The integration of animal energy with modern technology can enhance productivity and sustainability. While developing the equipment the locality, topography and social factors need to be carefully addressed. Moreover, multidisciplinary research projects and works should be taken up to make the animals and their energy more efficient for the farming community. Government policies and support programs are crucial for promoting the sustainable use of animal energy. Subsidies for animal husbandry, training programs for farmers, and research funding for improving animal breeds and equipment can help maximize the benefits of animal energy. The farmers must be trained and made aware of the advances of animal drawn implements and their advances. Nevertheless, new researches aiming at developing improved animal drawn implements and improving the efficiency of animal labor through better training and the use of ergonomic equipment.

CONCLUSION

The significance of animal energy in Indian agriculture is undeniable. From historical times to the present day, animals have been indispensable to farming practices across the country. Their economic and environmental paybacks make them a dynamic component of viable agriculture. While challenges remain, the potential for integrating animal energy with modern technology and improving efficiency offers a promising future for this traditional yet enduring source of power. By recognizing and supporting the role of animal energy, India can continue to enhance its agricultural productivity and ensure the livelihoods of millions of rural households. As an ambassador of organic farming, India has to preserve and use its animal energy more scientifically and should promote their use in coming days as well. As we look to the future, the challenge will be to find a balance between technological advancements and sustainable practices that honor the historical legacy of animal energy in agriculture.

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