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Editorial

Water-Livestock-Nexus

Anas Sarwar Qureshi *

Department of Anatomy, University of Agriculture, Pakistan, Faisalabad 38040, Pakistan

***Corresponding Author:** Anas Sarwar Qureshi, Department of Anatomy, University of Agriculture, Pakistan, Faisalabad 38040, Pakistan.

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During the last century, world population tripled but water use increased six-fold. The world population is expected to increase over 9.0 billion by 2050, 34% higher than today. Most recent and reasonable estimates suggest that to feed the increasing population in 2050, food production must increase by 70%. Annual cereal production will need to rise to about 3 billion tons from 2.1 billion tons today whereas meat production must rise to over 200 million tones. To produce this amount of food, irrigated land must increase by 35% and 20% more water is diverted to agriculture. On the other hand, due to decreasing investments in irrigation and increasing environmental concerns, expansion of irrigation land will not be more than 5% and water diversions for irrigation are projected to decrease by 8% due to climate change and other management issues. Furthermore, competition from domestic and industrial sectors is putting enormous pressure on agriculture sector to reduce its consumption of water.

Increased incomes and desire for changing lifestyles has resulted in changing nutritional needs, which has increased livestock products. Over the past two decades, the demand for animal products has increased two to three times faster in developing countries than in developed countries. It is predicted that, on a global scale, meat production will rise from 233 million tons in 2000 to 300 million tons in 2020, and a rise in milk production from 568 to 700 million tons over the same time span. From the group of animal products, the highest growth rates are expected to be achieved in poultry, pigs, eggs and milk production. These demands have made the livestock sector as one of the fastest growing agricultural sub-sector, employing 1.3 billion people and supporting about 4 billion people worldwide. Currently, livestock production contributes approximately 40% of the gross value of agricultural production worldwide.

The huge land and water resources consumed by expanding livestock sector have seriously threatened its long-term sustainability. Globally, 30% of the land surface is used for livestock production with 33% of arable land being used for growing livestock feed crops and 26% being used for grazing. Compared to crop products, animal products do not only require more land to obtain a certain nutritional value, but also more energy and water. On an average, 25 kcal of fossil energy is required to produce 1 kcal of animal protein, which is ten times greater than in the case of plant protein. Livestock sector also has a strong negative impact on environment as it contributes 18% of the anthropogenic greenhouse gas emissions and 37% of the anthropogenic methane emissions to the atmosphere worldwide.

Generally, it is believed that water use by livestock is restricted to drinking and servicing of animals. However, in reality, this is only a small portion of the total water used by the livestock sector. The major water consumption in livestock systems is associated with the water use for feed production, which is generally about 50 to 100 times more than the drinking requirements. Livestock systems that depend on grain-based feed, as is the case in the developed world, are much more water intensive than systems that rely on crop residues and pasturelands, as is the case in Africa and South Asia. It is now widely accepted that, in grain-based feed production systems, water use to produce one liter of milk varies from 1.96 to 4.6 cubic meters (m^3). This water consumption includes drinking, servicing and growing of alfalfa feed for animals. The meat production consumes much more amount of water than milk. Estimates of water requirements for producing one kilogram of beef meat vary from 10-15 m^3 of water (10,000-15,000 liters of water). In comparison, water consumed to grow one kilogram of wheat and rice grains is only 0.4-1.0 m^3 and 2-3 m^3, respectively. The amount of drinking water varies from 20–50 liters per animal per day and depends on the species, dry matter intake, composition and water content of the feed, animal size, and the

climate in which the livestock is managed. This clearly suggests that to ensure food security for the rising population of the world, water consumption by livestock sector must be reduced.

One of the novel approaches to reduce water consumption in agriculture and animal production is the changes in diet patterns, which essentially reduce consumption of meat products. However, the possible impact of dietary changes would differ from country to country depending on the current diets in a country. In countries where current meat consumption per capita is relatively high, like in the US and Australia, reduction in water consumption through diet change can be most substantial. However, in poor countries where meat consumption is low and livestock are produced mainly to earn livelihood, reducing livestock production can result in serious socio-economic problems.

Increasing livestock productivity can be a strategic intervention to overcome water and environment issues in agriculture. The livestock productivity can be achieved through better quality feed selection, grazing management, and decreasing animal morbidity and mortality. One of the major reasons of low livestock productivity in Asian and African countries is the poor quality of feed for animals. In developed countries, for example, feeding grain to livestock is a common practice, where approximately 40% of the total cereals produced are fed to animals. In Africa and Asia, however, only 14-20% of the grains produced are fed to livestock, of which much is fed to poultry. Instead, smallholder farmers prefer to grow crops that can meet both the needs for human food (grains) and animal fodder (crop residues like straw) consumption. The low quality feed produces low-yielding breeds, the prevalence of diseases, which causes high rates of livestock mortality.

In developing counties, high mortality rates are also related to the low capacity of veterinary health services to respond to disease outbreaks. The diseased and stressed animals lead to lower productivity and hence lower market values. Therefore, there is every motivation to invest more effort and capital in veterinary services if we are serious in future food security and alleviating poverty especially in poor developing countries. Animal scientists therefore have a sheer responsibility of developing low cost solutions to the animal diseases. Introducing modern animal production technologies can help a great deal in improving animal productivity. The veterinary scientists also need to develop information packages which should include guidelines for improved animal health, adequate herd management and animal husbandry, comprising decisions on type and number of animals, off take rates, slaughtering age and reproduction rates of different animals are equally necessary.

There is a strong nexus between livestock production and poverty alleviation because multiple products and services obtained from livestock production systems are of a physical, economic, environmental and socio-cultural nature. Livestock produce food (including proteins, fat, minerals, micronutrients and vitamins), energy (including draught power for land preparation and threshing, transport, fuel from manure) and enable nutrient cycling. Animals provide farmers with a source of income and the possibility of storing wealth, risk spreading and insurance against difficult (drought) periods. Therefore, water managers and animal producers need to work together to ensure that there is sufficient water available to meet the needs of meat and dairy. The water consumption for livestock production is currently increasing due to increasing demands for livestock products. Therefore, good water policy should include measures to confine the growth of the meat and dairy sector and nations must include the meat and dairy industry requirements in their future water plans. Water policies should also focus on increasing water-use efficiency with in agriculture and livestock sector.

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