Broadening Horizons
N°27 March 2016
Feedipedia
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Feeding strategies to enhance productivity and reduce the environment "hoofprint"

Harinder Makkar
Food and Agriculture Organization of the United Nations (FAO), Animal Production and Health Division, Rome, Italy

Global meat consumption and the high emissions of greenhouse gases from the livestock sector have been grabbing headlines. Livestock account for approximately 14.5% of all anthropogenic greenhouse gas (GHG) emissions (7.1 Gigatonnes of CO2-equivalent per year). The production, processing and transport of feed accounts for about 45% of this. Livestock production is also land and water intensive – it occupies 30% of the world's ice-free surface and consumes 8% of global human water use, mainly for the irrigation of feed crops.

It is also important to remember the substantial contribution that livestock makes to poor in developing countries, providing a vital source of protein, vitamins, minerals and income, as well as transport and manure. Livestock make their most important contribution to food security when they are produced in places where crops cannot be grown easily, such as marginal areas. By 2050 it is expected that the demand for animal products would be 60-70% higher than current levels. So it is clear that some strategies must be put in place to ensure that sector becomes as efficient and sustainable as possible. The livestock sector needs to be transformed.

Animals fed on agro-industrial by-products

The importance of feed and feeding, which has received little attention so far, is going to be key to this transformation. Towards this end, the United Nations Food and Agriculture Organization has developed a concept of sustainable animal diets, which integrates the importance of efficient use of natural resources, protection of the environment, socio-cultural benefits and ethical integrity. Here are just some of the innovative approaches that we believe can have a great impact, particularly in the developing world.

Meeting nutrient deficiency through supplementation

Animals that are deficient in minerals and nitrogen (protein) are less productive. Tree leaves, oil seed cakes, brans, urea-N and mineral mixtures can be provided as supplementation to overcome the nutrient deficiency. This results in higher animal productivity and is also expected to decrease emission of environment pollutants per unit of animal product formation. Correction of mineral and nitrogen deficiency in the field has been shown to increase milk production and reproductive efficiency of animals.

Reduction in feed waste and use of food waste

In many developing countries ruminant production is largely based on feeding of crop residues and agro-

industrial by-products. Straws worth millions of dollars are burnt every year in many parts of Asia and Africa, causing environmental problem and soil degradation, in addition to losing a valuable feed resource. Improved crop residue management could include the use of specially designed balers for collection of straw from the field, followed by the use of processing technologies for the manufacture of balanced complete feed for ruminants. Silage making, especially using locally available resources is also an attractive approach for reducing wastage of forages whose availability is high in rainy seasons. In some months of the year availability of vegetable and fruit wastes is also high, which can also be converted into a valuable resource through silage making. These resources can be used for feeding during the scarcity periods of dry season. Also opportunities exist to convert fruit and vegetable wastes from wholesale markets to animal feeds.impact of climate change on livestock production.

Smart feeding options

A technology has been developed for making "densified total mixed ration blocks" or "densified total mixed ration pellets" that combine straw, oil seed meals and nutrients. It provides an opportunity for feed manufacturers and entrepreneurs to supply balanced feeds to dairy and other livestock farmers on a large scale. Also it offers an opportunity for the feed manufacturers and entrepreneurs to remove regional disparities in feed availability. This technology can also be effective in disaster management and emergency situations that arise due to natural calamities, for example floods, droughts and man-made conflicts. Equally important is to provide knowledge and practical assistance to smallholder farmers to prepare balanced rations so that all the required nutrients are given to animals. Deficiency of even a single nutrient decreases animal productivity and increases environmental pollutants.

Alternate feed resources

The quest for alternative/additional food and feed ingredients is of paramount importance, mainly because of the global demand for grains, which has exceeded the production and the stiff competition between man and the livestock industry with the existing food and feeds. There are several promising new feed resources, including cassava residue, sweet sorghum residue, seedmeals from toxic Jatropha and castor after detoxification and from non -toxic Jatropha, pongamia meal, palm kernel meal, cassava peels, algae residue and other aquatic plants. Some insects such as the black soldier fly or maggots, yellow mealworm, silkworms and grasshoppers are also good sources of protein and macro- and micro-minerals. The protein content of insects could range from 40% to 60% on a dry matter basis, with protein quality as good as muscle protein. Leaf meal obtained from dense plantation of moringa plants yields higher protein per unit land than from soybeans, and the protein quality and their utilization from both these sources are similar; making this a promising feed for the future.

Grassland/Rangeland management

Grasslands and permanent pastures amount to 3.5 billion ha globally – more than twice the total area of croplands. In addition to food-crop-based feed systems, the restoration of grasslands including community lands using locally adapted forage plants, preferably legumes; and improved management of grazing land, for example rotation grazing need particular attention. Use of thornless cactus on dry lands, which comprise 40% of the world's total land area, is another good example that provides feeds in harsh environments as well sequester a large amount of carbon, both above and below the soil. These approaches can provide large resource use benefits in the form of carbon sequestration, water services, and biodiversity protection, and at the same time enhance productivity and livelihoods.

The approaches that enhance resource-use efficiency, including feed use efficiency do not only mitigate GHG emissions but are also a part of adaptation to the climate change.

Putting these strategies into practice is going to require investments in training and extension, to get them into farmers' hands, and ensure that they are relevant to their needs. Working together of public and private institutions would also be catalytic in putting the 'feed innovations' into practice. With the appropriate holistic action that enhances animal nutrition, reproductive efficiency and animal health, the livestock sector can be transformed to produce 'more from less' and reduce its environmental "hoofprint".

Note: A part of the text has also been published in http://www.farmingfirst.org/2016/02/harinder-makkar-strategies-to-transform-the-livestock-sector/

Further reading

Makkar, HPS. Smart livestock feeding strategies for harvesting triple gain – the desired outcomes in planet, people and profit dimensions: a developing country perspective. Animal Production Science, 2016, 56, 519–534.

http://dx.doi.org/10.1071/AN15557 (*full paper can be obtained from the author*)