



Necessitate of Engineering Approach for Animal Feeding System

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To satisfy rising demand of animal source foods while curbing the inevitable expenses is challenging to Indian farmer. Animal feed alone accounts more than half of the total expenses which could be managed using integrated approach. Therefore, current writing aims to explain importance of engineering approach and research in animal feed industry to reduce expenses and manage handling practices.

Introduction

India, with largest cattle populations among world holds the privilege to rank first in milk production with average annual growth rate of 5%. Delgado et al. (1999) made a prediction that the demand for milk will double in India by 2020. As per World Bank projection, worldwide demand for food will increase by 50% by 2030. Governments and industries must prepare for meeting escalating demand of animal source products in the country with long run policies and investments. The policies must satisfy not only ever rising consumer demand but encourage improving nutritional profile of such food, adapting improved management practices to reduce losses. Moreover, policies must be constructed with aim of opportunities of income generation and alleviate environment stress. This rapidly growing demand is severely stretching the capacity of existing livestock sector and required resources. The livestock industry is struggling to meet such drastic demands by using available (limited) resources in existing circumstances. To propel livestock industry further attention on nutritionally enriched hygienic feed, genetically superior breed, good management practices, good production methods etc. are vital. Among all the factors, feed is pivotal element in the livestock production as it accounts for 70% of the cost of production (FAO 2013).

Research Gap

Concerned to Indian livestock feeding, diverse system is adopted which comprise the roughage (crop residues and green fodder), byproducts of grain industry (corn stover, distillers grain, wheat husk, rice bran, oilseed cake, soya hull, etc.), and compound feed (processed feed). Use of byproduct feed needs to be escalate as they offer sublime features such as lower starch content, moderate protein content, good energy source and low cost. Properly managed byproducts diet program can improve both performance and monetary returns. On other hand, extensive use of byproducts and crop residues as feed not only saves the money but offers the nutritionally enriched feed and answers the grain-fuel-feed competition. In addition, their use saves green house gas emission that would have been emitted during grain and feed production (Mishra and

Dixit 2004). However, due to lack of awareness, limited storage facilities and inadequate handling systems, all of the residues are burnt in the farm and hence agricultural byproducts are underutilized.

The nutritionists are trying their level best to implement the research findings and improve the quality of feed using crop residues and byproducts. They are well aware about diet requirement; it must contain the necessary nutrients to support maintenance, growth, production, and health of animals. Feed additives should be present to provide the appropriate level of protection from disease and other maladies. In all cases, the levels of each ingredient must be controlled so as to be neither deficient nor toxic. The question that needs to be addressed is how well handling practices, storage structure and manufacturing techniques provides expected level of nutritional quality assumed by the nutritionist. Of course, the nutritional value of the feedstuff is important, but it is not the only feature of good feeding system. Consequently handling capabilities, storage facilities and producers preference for feedstuff handling can determine whether a particular feedstuff is a good choice for a particular livestock operation. Therefore, multidisciplinary approach is mandatory to ensure safe delivery of nutritional feed and smooth functioning of feeding system (Mamun-Ur-Rashid et al. 2013).

Physiological differences in feed ingredients (crop residues and byproducts) such as particle shape, size, and density becomes challenging problem to maintain free flow during handling, storage and mixing practices. Feed ingredients with similar size and density tend to blend easily and quickly. Minerals on the other hand have greater densities than that of grains and oilseed meals. Drugs have intermediate densities, but very fine particle size. Forages have low densities, and highly varied particle shapes and sizes. This diversity of physical properties of individual feed ingredients results into poor flowability and inconsistent mixing. Feed material with poor flowability tends to cake, stick and encourages mold growth along the walls of bulk storage bins and feeders. The flowability issue not only hampers the handling, storage and feeding system but also affects the quality and effective delivery of feed to the each animal. Feeder design impacts animal access to feed and their ability to waste feed during feeding. If feedstuffs are likely to cake or flow poorly in bulk it might cause animals to miss meals and go hungry. Problems occur when obstructions are break free and livestock engorge themselves on the feed they have been missing. Moreover, particle size of feed mixture influences the availability of nutrients as well as the digestibility of the animal. Evaluation of effect of ingredient physical parameters on livestock is still to be an active area of research (FAO 2013). Adopted handling systems are inadequate to cope with such challenges and satisfy the feeding requirements.

The hygroscopic nature of store feed (dried crop residues, husk, hull, corn stover, etc.) alters the moisture content with atmospheric conditions. Moisture absorption increases the probability of quality deterioration, mold growth or spoilage. Excess moisture effectively adds to the cost of other feed nutrients, including energy and protein. High-moisture products tend to bridge up and not flow as smoothly as dried products. These products can also corrode handling systems and storage facilities. To protect feedstuffs from rain, wind, rodent, birds, and insects damage and to limit feed waste a robust storage structure is needed. Commonly majority of producers followed traditional feeding practices and they resist the change/adoption of scientific recommendations and technologies. However, adopted handling systems are inadequate to cope with the challenges during feed handling. It implies that either producers needs to get update/educate with recent technologies or derived technology is not suitable to meet the farm level requirements.

Conclusion

Literature scan reveals that study on feed handling and storage systems are overlooked. Systematic research needed for characterization and mapping of animal feeding systems using sound field based approaches (Makkar and Ankers 2014). The strategic plan on feeding system will help to obtain better insight into how different feed resources can be utilized effectively. The attention also required on logistic activities because type of storage structure requires/restricts the use of specific delivery vehicle type. In hauling operation with features of minimum wastages, easy loading and unloading are crucial.

Therefore, research work with the strategic assessment needs to be focused to improve storage and handling practices of different byproduct feed at factory and farm level. The study must include the effect of different parameters involved in feed spoilage during storage. Special attention needed to solve the flowability issues of compound feed using the integrated approach. Multiphase analysis of flow pattern of compound feed mix needs to be investigating which will help to redesign and optimization of adequate processing conditions for optimum process/product performance.

Many scientists considered livestock is the major culprit behind green house gas emission. A wise thinking says everything on the planet had rational meaning behind their existence. Nothing is unnecessary and can be harmful until it crosses the critical threshold level. Study conducted by Mishra and Dixit (2004) suggested that proper management on feeding system and reducing wastages could be the only solution to balance the green house gas emission cause by livestock.

Livestock is the vital component of farmer's income and contributes to nation's prosperity significantly. Therefore, need of hour is to use engineering approach and implement sophisticated and feasible technology to avoid feed losses without compromising the nutritional quality during processing, storage and handling.

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