



SUSTAINABLE AGRO WASTE PROCESSING TECHNIQUE FOR CATTLE FEED PRODUCTION-A REVIEW

P. Hema Prabha¹, M.Saradhambal²

¹ Associate Professor, Department of Food Processing and Preservation Technology,

² Scholar, Department of Food Processing and Preservation Technology,
School of Engineering,

Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-641108

ABSTRACT:

India's economy depends largely on agriculture and a variety of crops are cultivated. Post harvest crop residues are either burnt out or thrown as waste in spite of their nutritive value. With the increase in population it is necessary not only to stabilize agricultural production but also to sustain by product utilization. Some of the nutritious by product are used for the cattle feed. Traditional feed can no longer meet the feed requirements which include only hay, straw etc. Food rich in calcium, phosphorus, protein and energy are required to produce high quality milk and keep them in good health. Food stuff that can be used for the cattle are peel, agro waste

Key words: Animal feed, Rice husk, Straw, Pellet and Feed Mill.

INTRODUCTION:

Livestock production is the backbone of Indian agriculture which contributes about 4.11 per cent of national GDP and 24.60 per cent of agricultural GDP (Swathy et.al, 2020). It also plays an integral role in the livelihood of poor farmers by providing economical, social and food security.

Feed industry in India is about 50 years old. It primarily consists of cattle feed and poultry feed segments. Cattle feed industry in India is gradually evolving into an organized sector and the feed manufactures are increasingly using modern and sophisticated methods that seek to incorporate best global practices. To meet

this demand, huge quantity of feed resources will be required. Already there is a considerable shortage of feed availability in most developing countries.

A variety of feeds from perennial crops, multipurpose trees and shrubs, weeds and agro-industrial byproducts are included in the cattle feed. They are excellent source of nutrients which keep intestinal microflora active for digesting cellulosic biomasses. (Rajan Katoch et al; 2018)The challenge can be alleviated by the use of unconventional feedstuffs in animal feeding depending on their nutrient content, availability and acceptability to animals and provided it is economical compared to conventional feed ingredients . Agriculture and animal husbandry are two major components interwoven with the intricate fabric of diverse culture, religious beliefs and economic values in the rural community. The efficient utilization of these components is absolute for improving the socioeconomic status of rural households. India is basically an agrarian country, where crop farming and rearing of livestock have economic and socio-cultural roles in wellbeing of the rural households. Although India has the largest population of livestock in the world, but their productivity is comparatively low (Rajan et.al, 2018). For any agriculture-based country fodder crops are as much important as grain crops. Livestock sector being sub-sector of Indian agriculture contributes about 9 per cent to GDP and employs around 8 per cent of the labor force. In such context crops with multiple uses it fetches more area as compared to others because crop residues used as animal feed and fodder (Grothmann, et.al, 2017). In cattle feed industry, a major ingredients of animal feed industry is currently evolving from a fragmented industry into an organized sector. The feed manufacturing is adopting a modern and comfortable method in latest years. The cattle population is expected to growth rate of 4 per cent. In Silage production the products like corn, barley, winter wheat, rye, winter rye and triticale are used. Some of the cattle feed include grains, legume, straw such as oats, barley, rye, corn, cereal grain chaff baled ,pea, flax, lentil, etc. The main three types of cattle feed types are cattle cubes, pellets, flakes and textured cattle feed. The feed utilized here is classified into three types; these include the roughage, concentrates, and mixed feeds. Roughage feed include the pasture forges, hays, silages, and by products feeds.



Fig 1: Raw materials (grains)

Animal feed:

Animal feed are mainly used in the major parts of the agro waste. In this modern world the animal feed are produced based on the selection of grains with proper processing, selecting and blending ingredients to provide highly nutritional diets that both maintain the health of the animals and increase the quantity. The animal feed generally contains grains, plant proteins.

Types of animal feed:

It includes hay, straw, silage, compressed and pellet feeds, oils and mixed rations, and sprouted grains and legumes. Feed grains are the most important source of animal feed globally.

Hay:

Fig 2: Hay

Hay in agriculture is termed as dried grasses and other foliage used as animal feed. Usually the material is cut in the field while still green and then either dried in the field or mechanically dried by forced hot air. Typical hay crops are timothy, alfalfa, and clover.

Green forages are considered to be the backbone of dairy sector as they play a vital role in transforming dairy farming into a profitable business. So, there is urgent need for preservation of nutrients from green forages including fodder tree leaves available during the flush period for feeding livestock during lean period so that high yielding animals can be sustained for profitable dairy farming. Silage is as nutritious as green fodders as it preserves the nutrients in the original form and hence it is as good for animal feeding as green fodder itself.

Flakes:**Fig 2: Flakes**

Corn is the most commonly used raw material for energy (carbohydrates) supply in cattle feed in Korea (C.Thomas, 2020). Until recently, various processing methods including grinding, extrusion, and flaking have been applied to increase the availability of corn. In particular, corn flakes are widely used in cattle feed in Korea owing to increased starch digestibility (Ankur Tripathi, 2018) resulting from flaking and increased energy supply (Indrani,2020) for the generation of marbling adipose tissue (Britannica.com). Corn flaking destroys the hull, endodermis, and protein matrix surrounding starch granules in the endosperm via exposure to high temperature, moisture, and pressure, and it induces gelatinization of the normal semi-crystalline structure of starch granules to improve the starch digestibility (Wikipedia.com).

Rice straw:**Fig 3: Rice Straw**

Rice husk is a large-tonnage waste left from rice production. It is not subject to humification and therefore becomes a serious environmental pollutant. Due to the presence of two essential elements—carbon and silicon—in its composition, rice husk is a promising organo-mineral raw material. The known methods for processing of rice husk are associated with the formation of even more aggressive waste: (Satbaev et al; July 2021). Rice straw is abundantly available from paddy cultivation and farmers offer rice straw as the main roughage source to their animals. This is particularly the case in developing Asian countries such as Thailand, Vietnam, Indonesia and India .Approximately 80% of the world’s rice is grown by small scale farmers in many developing countries including South East Asia and it is common to use rice straw for animal feeding.

Pellets:

Pellet feeds have been defined as “agglomerated feeds formed by extruding individual ingredients or mixtures by compacting and forcing through die openings by any mechanical process”.



Fig 4: Pellet Feed

Powder:

Animal feed is food given to domestic animals, especially livestock, in the course of animal husbandry. There are two basic types: fodder and forage. Used alone, the word feed more often refers to fodder. Animal feed is an important input to animal agriculture, and is frequently the main cost of the raising or keeping of animals. Farms typically try to reduce cost for this food, by growing their own, grazing animals, or supplementing expensive feeds with substitutes, such as food waste like spent grain from beer brewing. All the raw materials are grained and made into powder. The course materials are grained fine powder.

LIFE STABILITY OF CATTLE:

Increasing efficiency in livestock production and reducing the share of animal products in human consumption are two strategies to curb the adverse environmental impacts of the livestock sector. The provision of high-quality feed to animals is essential to meet their physiologic needs, specifically growth, maintenance, and reproduction. There are numerous products, which differ in nutrient content, available in various formulations from a variety of feed manufacturers.

A primary directive when formulating feed is to ensure sufficient content of the six classes of *nutrients*: water, carbohydrates, fats (lipids), proteins, minerals, and vitamins. While all animals require each of the six classes of nutrients, some species may require higher levels of specific nutrients than others. Additionally, nutrients are considered either essential or nonessential. Essential nutrients are those that an animal cannot synthesize or cannot synthesize in sufficient quantities to maintain health and must be obtained from an external source, that is, in the diet. It is important to recognize, when selecting a diet, that a particular nutrient may be essential (i.e., necessary in the diet or otherwise provided) for some species but not for others. Nonessential nutrients are those nutrients that can be produced by the animal or its microbial flora and are not a dietary requirement.

CONCLUSION:

In this paper we conclude that the cattle feed can be used in all the forms such as pellets, flakes, straw and hay. It has high quality nutrients. This method of animal feed production provides a new highly effective food product for cattle which contains high nutrients and proteins. Large quantities of cattle production like green forages are considered to be the backbone of the dairy sector as they play a vital role in transforming dairy farming into a profitable business. So, there is an immediate need for the preservation of nutrients from green forages including fodder tree leaves available during the flush period for feeding livestock during lean periods so that high yielding animals can be sustained for profitable dairy farming.

REFERENCES:

1. Akter, Y., Akbar, M. A., Shahjalal, M., & Ahmed, T. U. (2004). Effect of urea molasses multi-nutrient blocks supplementation of dairy cows fed rice straw and green grasses on milk yield, composition, live weight gain of cows and calves and feed intake. *Pakistan Journal of Biological Sciences (Pakistan)*.
2. Cardozo, P. W., Calsamiglia, S., Ferret, A., & Kamel, C. (2005). Screening for the effects of natural plant extracts at different pH on in vitro rumen microbial fermentation of a high-concentrate diet for beef cattle. *Journal of animal science*, 83(11), 2572-2579.
3. Chakraborty, I. N. D. R. A. N. I., Kumari, P. U. M. M. Y., Pahuja, S. K., TOKAS, J., & KUMAR, V. (2020). Elucidation of combining ability and fodder potential of sorghum hybrids. *Forage Res*, 46, 132-140.
4. Kokić, B. M., Lević, J. D., Chrenková, M., Formelová, Z., Poláčeková, M., Rajský, M., & Jovanović, R. D. (2013). Influence of thermal treatments on starch gelatinization and in vitro organic matter digestibility of corn. *Food and Feed research*, 40(2), 93-99.
5. Hernández-Castellano, L. E., Nally, J. E., Lindahl, J., Wanapat, M., Alhidary, I. A., Figueiro, D., ... & de Almeida, A. M. (2019). Dairy science and health in the tropics: challenges and opportunities for the next decades. *Tropical Animal Health and Production*, 51(5), 1009-1017.
6. Katoch, R. A. J. A. N., Tripathi, A. N. K. U. R., & Sood, S. U. R. B. H. I. (2018). Possibilities of non-conventional feed resources in livestock feeding—a review. *Forage Res*, 44, 141-151.
7. Kokić, B. M., Lević, J. D., Chrenková, M., Formelová, Z., Poláčeková, M., Rajský, M., & Jovanović, R. D. (2013). Influence of thermal treatments on starch gelatinization and in vitro organic matter digestibility of corn. *Food and Feed research*, 40(2), 93-99.
8. <https://www.britannica.com/topic/hay-animal-feed>
9. https://en.wikipedia.org/wiki/Animal_feed#:~:text=It%20includes%20hay%2C%20straw%2C%20silage,source%20of%20animal%20feed%20globally.
10. <https://www.cpm.net/downloads/Animal%20Feed%20Pelleting.pdf>

11. https://img1.exportersindia.com/product_images/bc-full/2018/12/3934372/animal-and-cattle-feed-raw-material-1544272680-4549185.png
12. Pethick, D. W., Harper, G. S., & Oddy, V. H. (2004). Growth, development and nutritional manipulation of marbling in cattle: a review. *Australian Journal of Experimental Agriculture*, 44(7), 705-715.
13. Qiao, F. Q., Fei, W. A. N. G., REN, L. P., ZHOU, Z. M., MENG, Q. X., & BAO, Y. H. (2015). Effect of steam-flaking on chemical compositions, starch gelatinization, in vitro fermentability, and energetic values of maize, wheat and rice. *Journal of Integrative Agriculture*, 14(5), 949-955.
14. Schader, C., Muller, A., Scialabba, N. E. H., Hecht, J., Isensee, A., Erb, K. H., ... & Niggli, U. (2015). Impacts of feeding less food-competing feedstuffs to livestock on global food system sustainability. *Journal of the Royal Society Interface*, 12(113), 20150891.
15. Ministry of Agriculture, Food and Rural Affairs (MAFRA). (2014). Agriculture, food and rural affairs statistics yearbook.
16. AH, S., & THOMAS, U. C. MECHANIZATION IN FODDER CROP PRODUCTION—A REVIEW.
17. Zinn, R. A., Owens, F. N., & Ware, R. A. (2002). Flaking corn: processing mechanics, quality standards, and impacts on energy availability and performance of feedlot cattle. *Journal of Animal Science*, 80(5), 1145-1156.
18. <https://5.imimg.com/data5/KD/QR/OJ/ANDROID-18974780/1576565756530-jpg-500x500.jpg>
19. <https://sc04.alicdn.com/kf/Hcb40a2d124f84a33a6b69679266a845fC.jpg>
20. <https://ae01.alicdn.com/kf/HTB1yKVzDb1YBuNjSszhq6AU5FXaz/Farm-Use-Animal-Feed-Flat-Die-Pellet-Mill.jpg>

