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NON-CONVENTIONAL FEED RESOURCES

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India is basically an agricultural country and about 70 per cent of its population live in villages. Their livelihood is dependent mainly on agriculture and animal husbandry. Though India has a huge livestock population of over 343 millions, besides poultry, yet the production of per animal milk and other livestock products is about the lowest in the world. It is evident that we are highly deficient in various livestock products, though we have about one-fourth of the total cattle population of the world. The analysis of this situation reveals that one of the main reasons for the low productivity of our livestock is malnutrition, under-nutrition or both, besides the low genetic potential of the animals.

Availability, vis-a-vis the requirement of green-fodder crops and concentrates, that there is a huge gap between demand and supply of all kinds of feeds and fodders. On the other hand, if we examine the land resources available for growing fodder and forage crops, it is estimated that the average cultivated area devoted to fodder production is only 4.4 per cent of the total area. Similarly, the area under permanent pastures and cultivable wastelands is approximately 13 and 15 million hectares respectively. Likewise, the total area under forests is 2.51 crore hectares and that open to grazing is 2.1 crore hectares. All these resources are able to meet the forage requirements of the grazing animals only during the monsoon season. But for the remaining periods of the year, the animals have to be maintained on the crop residues or straws of jowar, bajra, ragi, wheat, barley, etc. either in the form of whole straw or a bhusa, supplemented with some green fodder, or as sole feed. The crop residues are available mainly from wheat, paddy, bajra, jowar, ragi, sugarcane trash, etc. But now it is necessary to search and increase the nutrient utilization of crop residues as well as nonconventional feeds.

Non-conventional feed resources (NCFR)

The non-conventional feed resources (NCFR) refer to all those feeds that have not been traditionally used in animal feeding and or are not normally used in commercially produced rations for livestock. NCFR include commonly, a variety of feeds from perennial crops and feeds of animal and industrial origin. The term NCFR has been frequently used to describe such new sources of feedstuffs as palet oil mill effluent and palm press fibre (oil palm by-products), single cell proteins, and feed material derived from agro industrial by-products of plant and animal origin. Poor-quality cellulosic roughages from farm residues such as stubbles, haulms, vines and from other agro-industrial by-products such as slaughter-house by-products and those from the processing of sugar, cereal grains, citrus fruits and vegetables from the processing of food for human consumption also comes under category of NCFR.

Need of Non-conventional feed resources

There are serious shortages in animal feeds of the conventional type. The grains are required almost exclusively for human consumption. With increasing demand for livestock products as a result of rapid growth in the world economies and shrinking land area, future hopes of feeding the animals and safeguarding their food security will depend on the better utilization of unconventional feed resources which do not compete with human food. The availability of feed resources and their rational utilization for livestock represents possibly the most compelling task facing planners and animal scientists in the world. The situation is acute in numerous developing countries where chronic annual feed deficits and increasing animal populations are common, thus making the problem a continuing saga.

Thus non-conventional feeds could partly fill the gap in the feed supply, decrease competition for food between humans and animals, reduce feed cost, and contribute to self-sufficiency in nutrients from locally available feed sources. It is therefore imperative to examine for cheaper non-conventional feed resources that can improve intake and digestibility of low quality forages. Feedstuffs such as fish offal, duckweed and kitchen leftovers (i.e., potato peel, carrot peel, onion peel, and cabbage leftover), poultry litter, algae/*Spirulina*, *Leucaena* leaf, local brewery and distillery by-products, sisal waste, cactus, coffee parchment and coffee pulp are commonly used in India, and could be invaluable feed resources for small and medium size holders of livestock.

Advantages of NCFR

a) These are end products of production and consumption that have not been used.

b) They are mainly organic and can be in a solid, slurry or liquid form. Their economic value is often very less.

c) Fruit wastes such as banana rejects and pineapple pulp by comparison have sugars which are energetically very beneficial.

d) The feed crops which generate valuable NCFR are excellent sources of fermentable carbohydrates eg. cassava and sweet potato and this is an advantage to ruminants because of their ability to utilize inorganic nitrogen.

e) Concerning the feeds of crop origin, the majority are bulky poor-quality cellulosic roughages with a high crude fibre and low nitrogen contents, suitable for feeding to ruminants.

f) They have considerable potential as feed materials and their value can be increased if they are converted into some usable products.

Agro-industrial by-products

Appropriate use of relatively inexpensive agricultural and industrial by-products is of paramount importance for profitable livestock production. However, high cost and low availability of conventional livestock feedstuffs frequently demand consideration of by-products even if efficiency of utilization is low. Efficient use of by-products relies on their chemical and physical properties, which influence production system outputs. In developing countries, grain, which forms the bulk of concentrate feeds for livestock, is both in short supply and expensive due to direct competition with human food uses.

Natural pasture that is estimated to contribute to 80–90% of livestock feeds and whose quality is seasonally variable is the main source of feed in arid and semi-arid pastoral areas, while crop residues contribute up to 50% of the feed supply in mixed-farming system. Grazing lands are steadily shrinking by conversion to arable lands, and natural pastures are also restricted to areas that are marginal and have little farming potential. The reduction in natural pasture has led to overutilization and domination by undesirable forage species resulting in partial dependence on crop residues by most ruminants, which has reduced livestock

productivity. The increasing human demands for several foods (i.e. olive oil, vegetables, wine, fruit juices, etc.) led to a considerable increase of lands occupied by crops producing these feeds. Consequently, huge amounts of agro-industrial by-products are available in numerous developing countries (e.g. molasses, olive cake, winery marc, etc.), which are still not fully utilized in livestock feeding. Most of these AIBPs are low in main nutrients. Moreover, the difficulty of the use of these feed sources as fresh material for extended periods and the lack of efficient ways for their integration in feeding calendars may account for their under-utilization.

MAJOR BY-PRODUCT FEEDS FROM TREE AND CROPS

	Crop	**Scientific name**	**By-product feed**
Tree crops	Cocoa	*Theobroma cocoa*	Cocoa bean waste. Cocoa pod husks
	Coconuts	*Cocos nucifera L*	Coconut meal
	Oil Palm	*Elaeis uineensis*	Oil palm sludge (dry) Palm press fibre Palm kernel meal
	Rubber	*Hevea brasiliensis*	Rubber seed meal
	Sago	*Metroxylon_selo*	Sago refuse
Field Crops	Castor	*Ricinus communis L.*	Castor meal
	Cotton	*Grossypium spp*	Cotton seed meal
	Maize	*Zea mays*	Maize bran Maize germ meal
	Rice	*oryza sativa*	Broken rice Rice bran Rice husk Rice straw
	Sugarcane	*Saccharum officinarum*	Bagasse Green tops Molasses
	Cassava	*Manihot esculenta Crantz*	Tapioca waste
	Wheat	*Triticum aestivum L.*	Wheat bran Wheat straw

MINOR BY-PRODUCT FEEDS FROM VARIOUS SOURCES

	Crop/ Animal	Scientific name	By-product feed
Plants	Cassava	*Manihot esculenta Crantz*	Cassava leaves
	Dbupa	*Veteria indica*	Dhupa meal
	Groundnut	*Arachis hypogaea*	Groundnut vines Groundnut meal
	Guar	*Cyampsis psonaloides DC*	Guar meal
	Kakan	*Salvadoza oleoides*	Kakan meal
	Karaj	*Pohogomia pinnata)*	Karaj meal
	Kakum	*Garcinia indica chois*	Kakum meal
	Kusum	*Schleichara oleosa*	Kusum meal
	Mahura	*Madhuka indica*	Mahua meal
	Mango	*Mangifera indica*	Mango kernel
	Nahor	*Mesua ferrca linnn.*	Nahor meal
	Neem	*Azadirachta indica*	Neem meal
	Oak	*Obercus dilatata*	Oak meal
	Pineapple	*Annanas comosus*	Pineapple waste
	Pisa	*Actinedaphne hooberi*	Pisa meal
	Sal)	*Shorea robusta Gaerth*	Sal seed meal
	Sesame	*Sesammum indicum L.*	Sesame cake
	Soyabean	*(Glycine soya)*	Soya bean
	Sweet potatoes	*Ipomoea batatas*	sweet potato vines
	Tamarind	*Tamarindus indica*	Tamarind seed hulls Tamarind seed kernels
Animals	Poultry		Poultry litter (dry)
	Ruminants		Blood meal, Meat and bone meal] (dry), Rumen contents (wet)

Conclusion

The main reason for the poor animal production is the inadequate supply and low level of feeding due to serious shortage of feedstuffs. A major gap exists between the requirements and supplies of nutrients for feeding of animal, the non conventional feeds could partly fill this gap. More information is required on chemical composition, nutritive value and their utilization. Farmers are not aware of the nutritive value of some feed sources and the way for their efficient integration in livestock feeding. The involvement of local extension agencies in technology development for efficient use of NCFR, assessment and transfer is equally important. Several factors may account for their limited use, among which is their low nutritive value, Seasonal availability, high cost of handling and transportation from the production site to the farm, presence of anti-nutritional factors. It is essential to increase feeds by growing more fodders, propagating agro and social forestry, improving the nutritive value of crop residues and utilising other NCFRs. Crop residues, AIBPs and browse foliage are

certain an increasingly important role as feeds in the future, as human and livestock populations expand.

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