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Popular Article

Feeding of Cattle and Buffalo During Natural Calamities

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Introduction

India is one of worst disaster-prone countries of the world. Disasters continue to occur without warning and are on an increase in their magnitude, complexity, frequency, and economic impact. India has traditionally been vulnerable to natural disasters like floods, droughts, cyclones, earthquakes, and landslides due to its unique geo-climatic conditions. Among various natural calamities, flood is the major devastating natural calamity resulting in heavy loss of vegetation. In Indian subcontinent, drought is predominantly characterized by monsoon failure. The major effects of natural disasters are acute shortages of food, feed, fodder and drinking water which adversely affect human and livestock health and nutrition. Severe malnutrition due to natural calamities may depress growth, productive and reproductive performance. Therefore, there is a need to formulate feeding strategy for maintenance of animals to ensure its survival during and after the natural calamity.

Nutrient supplementation strategy during disaster

The water availability during drought is essential as water helps to regulate the body temperature and required for transport of nutrients among other functions. The water requirement is related to factors like heat load, production traits and DM intake. The water requirement of lactating cows is in the range of 2.5–4.5 L/kg DM intake. During water scarcity, the watering frequencies in large ruminants should be reduced to once in 2-3 days. This has the advantage of reducing overall feed and water consumption with possible improvement in nutritional benefits in terms of increased feed digestibility and feed conversion efficiency.

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Table 1. Short term dietary requirements of Cattle during calamities.

S.No.	Animal	Water (L/d)	Feed (kg/d)
1.	In production	26.5-34.0	0 9.1 hay
2.	Cow with calf	30.3-34.0	5.4-8.2 legume hay
3.	Calf (180 kg)	15.0-22.7	3.6-5.4 legume hay

(FEMA, 1998)

Pastures and native range that are dormant due to drought conditions may be low in energy, vitamin A, phosphorus, and protein. Meeting the need for these nutrients is important if herd productivity is to be maintained. Several options are available for supplying energy to cattle on drought stressed pasture. Generally, up to 0.2% of body weight of supplemental grain per head per day will not result in large decreases in forage intake and digestion. For some grains, processing may be necessary for optimum use by cattle. Avoid fine grinding and rolling, which results in excess fines and dust. Protein supplementation may be necessary for optimum breeding rates during drought conditions. Protein supplements (cottonseed meal, soybean meal), commercial protein rich concentrate mixtures would be appropriate. Alfalfa hay, sunflower meal, safflower meal, as well as other protein meals may also be used as protein supplements. Provide dry cows with approximately 250 g of supplemental crude protein and lactating cows with 300-400 g of supplemental crude protein per day. This can be fed as approximately 400-550 g of soybean meal for dry cows and 800 to 1000 g of soybean meal for lactating cows. Grain processing byproducts such as wheat midds, soybean hulls, and corn gluten feed that contain highly digestible fibre provide energy while alleviating much of the negative impact that grain supplementation has on fibre digestibility. In addition, these byproducts provide protein that may also be limiting in drought stressed forages.

Feeding strategies during natural calamities

While developing the feeding strategies during natural disasters, the first priority should be to save the animals from starvation and the next priority should be to sustain productivity of the survived animals. Therefore, animals should be fed to maintain weight above the critical bodyweight or to preferentially feed productive stock such as pregnant and lactating cows. Critical body weight is the body weight below which mortality rate rises rapidly. The survival or critical body weight varies with species, strain, breed and age of the animal. It has been reported that cattle will die if weight loss is >20% of critical body weight while sheep and camels can tolerate weight loss up to 30% of the critical body weight. Obviously, the weight loss that can be tolerated depends on the original weight and body condition of the animals as

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well as on the physiological status of the animals: i.e., young stock tolerates less weight loss compared to mature animals. An adult animal in good condition can also lose more weight than the same animal in poor condition. Animal deaths in drought are mainly due to exhaustion of body fat reserves. The tissues of animals dying due to starvation contain less than 1.0% crude fat. Animals can be saved only by reallocating the feedstuffs to different categories of animals in the herd like diverting some feedstuffs from growing as well as from milking animals to the starving animals. When livestock are evacuated and housed in large numbers, adequate amounts of feed may be difficult to procure.

I) Restricted feeding

A. Various feeding strategies

During feed restriction, basal metabolism is reduced mainly because of decrease in volume and metabolic activity of the viscera. Other tissues also show a shift in the metabolism of nutrients and energy sources. Adipose tissue and liver release enhanced amounts of free fatty acids and ketone bodies, respectively which are used by muscles and other extra hepatic tissues as energy substrates. Feed restriction by offering only 75% of NRC (2001) feeding standard resulted in low DM and N intake without affecting the digestibility of nutrients in buffaloes.

II) Reallocation of a given amount of feed in the herd

The first major option to overcome a feed shortage is to adjust the animal production to the feed availability. The mortality in herd was assumed to be entirely caused totally by starvation and therefor, mainly three strategies to adjust feeding patterns and reduce mortality rates considered were

- Diversion of nutrients from milk producing animals to all other animals of the entire herd. This would reduce total milk production and greatly reducing farmer's income, but securing the survival of more animals.
- Diversion of nutrients from growing animals and bullocks to save other livestock. If the growing animals were fed sufficient nutrients to gain 400 g/day and bullocks and old cows were offered 80% of their requirement. In this strategy milk production is not reduced and 1/3rd mortality can be reduced but at the same time the feeding of animals below their requirements is risky because more animals may die eventually if the calamity continues for a longer time.
- Diversion of nutrients from both milk producing and growing animals to the starving animals. In this case farmer will neither lose so many animals and nor cut milk production as drastically as in previous option. In this strategy some nutrients would be diverted from milking as well as from growing animals, thereby saving almost all animals.

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III) Purchase of feed from surplus location

The second major option to save animals is to purchase feeds from surplus regions. The transportation of feeds happens to be the best option to save the animals in drought but transportation of feed is only an option if the drought is regional. It has little or no value if infrastructure is highly damaged (floods) or if the calamity is of a much larger scale (severe droughts that occur throughout most of India). High transport costs are involved particularly in a large country like India where extreme droughts and rains can occur simultaneously. Although the calculation shows that at larger distances, i.e., beyond 200 km. the cheaper transport of concentrates favours the cost of nutrients from grains over dry grass. But the option of grain feeding however has limited value as it is already scarce under normal circumstances and are not likely to be diverted from human consumption in the calamity that also affects human nutrition. Therefore, feeds available for purchase include agro-industrial byproducts such as bagasse, grain milling byproducts and molasses or grasses and straws from the fields. Grasses from forest areas or crop residues from regions with surpluses are commonly transported to feed animals during droughts. In the case if transport costs were higher than costs of the feed itself, then attention is given to reduce transport cost for the bulky feeds by densification.

IV) Densification of feeds

One way to reduce transport costs is to compress or to densify the bulky feeds. There was 2.25 - 2.70 times increase in bulk density of straw based complete feed. Densities can be increased from 65 - 75 kg/m^3 to 100 - 110 kg/m^3 by baling or even 300 - 500 kg/m^3 by briquetting, which seems very high however. Considering the costs of baling grass, the quantity of feed which can be transported in each truck is more than doubled after baling. The calculations of show that when transport distance exceeds 50 and 150 km the costs of baling are recovered by reduced transport costs. Extra benefits like reduced storage costs, less spoilage and consequently increased quality of the feed are likely to occur but it depends on the type of straw and the method of densification.

V) Reduction of wastage by chaffing: -

If straw is insufficiently available for feeding of all animals, the reduction of wastage might be an option. 15-20% of the straw offered was refused when it was fed unchaffed. It also reduced the selection by the animals for the most digestible parts like leaves.

VI) Use of conserved fodders

During drought or floods, there is an acute shortage of feeds and fodders. This gap

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between demand and supply can be bridged considerably by transporting green, ensiled, dry roughages from surplus regions to deficient areas. Fruit and vegetable wastes can also be ensiled with or without wheat or rice straw. Baby corn husk or baby corn fodder are harvested and wilted for few hours in summer and 1-2 days in winter and then chopped and ensiled like conventional. Fresh empty pea pods (EPPs) available after shelling peas is an excellent source of nutrients for ruminants. These are mixed with wheat straw in 75% EPPs and 25% straw ratio to obtain 34-35% DM required for making good silage. Similarly, citrus waste can also be ensiled with wheat or rice straw. The silage is incorporated in the total mixed ration (TMR) at the rate of 25% on DM basis. In the TMR, the roughage to concentrate ratio is kept approximately 65: 35 (DM basis) and fed to cows or buffaloes. Likewise, berseem, lucerne or oat hay can be baled (250 kg/m^3). The baled hay or silage of conventional or non-conventional fodders can be easily transported to the affected region and fed to the animals.

VII) Feeding of non-conventional feedstuffs

Table 2. Level of incorporation of unconventional feedstuffs in the concentrate mixture of ruminants

Unconventional feed	Calves		Lactating cows	
	Level (%)	ADG(g/d)	Level (%)	Milk yield(kg/d)
Rubber seed cake	30	500	25	7-8
Spent annatto seeds	20	350	-	-
Tea waste	20	350	-	-
Vilayati babul pods	20	630	30	7
Mango seed kernel	-	-	10	8
Babul seeds	-	-	15	8
Sal seed meal	-	-	10	7.5
Tamarind seed powder	25	800	-	-
Niger seed cake	57	419	-	-
Spent brewer's grains	50	632	50	7-8
Karanj cake	24	412	-	-
Damaged apple waste	30	425	-	-

(AICRP, 1983)

These feeds help in reducing the deficit of animal feeds as well as to make livestock

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production more economical and profitable. Some unconventional feed sources that can be used have been mentioned in Table 2 and remaining other unconventional feed resources e.g. *Mahuva (Madhuca indica J.F. Gmel.)* seed cake, Mahuva flowers, *Salvadora oleoides Dane (Var. persica Linn.)* deoiled cake, subabul (*Leucaena leucocephala*) seeds, sea weeds (Sargassum spp.), rain tree pods (*Pithecolobium saman*), tomato (*Lycoperiscon esculentum* Mill.) waste, isabgul gala and isabgul lali (*Plantago ovata* Forsk.), neem cake (*Azadirachta indica*) kusum cake (*Schleichera oleosa* Willd.), palm (*Borassus flabellifer Linn*.) male flower, jowar gluten and jowar cake (*Sorgum vulgare Pers.*), Banana root bulbs (*Misa paradisiaca Linn.*) etc. can be used in the ration of livestock.

VIII) Urea treatment of straw

The transport of urea or ammonia, and treatment might be cheaper than the purchase and transport of additional concentrate or roughage. Urea-treated straw saves on concentrate feeding, increases milk yield by 1-2 litres/animals a day, offers better economic returns to the farmers and may help reducing land area required for green fodder production. Increased intake of treated straw also helps to improve the health and productivity of animals. The process is very simple and involves spraying of urea solution uniformly over the straw and storing it for a specific time period. The process of urea ammonisation of straw is as follows Straw-1000 Kg, Urea,40 kg, and 400 Liter water.

IX) Urea molasses multi-nutrient blocks (UMMBs)

It is a blend of energy, protein, and minerals for strategic supplementation in the ration of ruminants to enable animals to survive until pasture conditions improve during natural calamities. The UMMB is a convenient and inexpensive method of providing a range of nutrients to the animals. It can improve the utilization of low-quality roughages by satisfying the nutrient requirements of the rumen microorganisms, creating a better environment for the fermentation of fibrous material, and increasing production of microbial protein and volatile fatty acids. UMMB prepared by using non-conventional feedstuffs is as effective as that prepared by using conventional ingredients. The use of such unconventional resources economized the cost of producing UMMB. The UMMBs can also be prepared by replacing: a) wheat flour with waste bread; b) oiled mustard cake with tomato pomace and c) molasses replaced by using spent sugar syrup available from amla (*Phyllanthus emblica*) processing industry.

X) Complete feeds

Complete feeds imply a system of feeding all ingredients including. roughages,

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processed and mixed uniformly, to be made available at libitum to the animals. It can be in mash and pelleted form when this product is fed as sale source of nutrients. Pelleting feeds increases voluntary intake by 3-30% but adds to processing cost by 57-130% depending upon the type, percentage, and original cost of roughages in the ration, if baling of fibrous feeds is practiced, it can be useful to produce complete feeds for use during droughts, i.e., to add some concentrate ingredients. Biologically, the use of complete feeds with an appropriate balance of roughage and concentrates may lead to better utilization of locally available crop residues, agricultural-byproducts, and waste. Complete diets for livestock could benefit rural farmers during periods of feed shortage if the feed and transport costs can be kept low. Many complete feeds using locally available byproducts like bagasse, mixed with tree leaves and other unconventional byproducts have been developed. However, the composition of the complete feed needs to be adjusted to the production level of animals.

XI) Feeding Of Tree leaves and grasses

Trees have the advantage that they produce fodder even in harsh conditions. The comparative evaluation of tree leaves and grasses indicated that tree leaves had significantly higher CP, EE, Ca and tannins and lower cell wall constituents as compared to grasses and a reverse trend was observed for lignin. Tree leaves had better digestion kinetics for DM than wild grasses. The former had significantly higher degradation rate, effective DM degradability, low rumen fills as compared to latter. The leaves of *Melia azedarach*, *Morus alba* and *Leucaena leucocephala* supplemented with mineral mixture and common salt could be fed as a complete feed to ruminants. It was concluded that the leaves of *Morus alba*, *Ehretialeavis*, *Greweaoptiva*, *Melia azadrach* and *Leucaena leucocephala* has high potential as livestock feed while feeding of *Ougeinia oojeineusis*, *Zizyphus xylopyrus* and *Dodonea viscose* leaves should be avoided. The arid zone wild grasses like *Taraxacum purpureum* and *Saccharum spontaneum* and CAZRI 75 of *Cenchrus ciliaris* and CAZRl 76 of *Cenchrus setigerus*, *Lasiurus sindicus*, *Dichanthium annulatum* and *Lasiurus sindiclls* also showed high potential as livestock feed. These leaves or grasses can be incorporated in the densified complete feed blocks.

XII) Silvipastoral systems for fodder production

Silvipasture is the intentional combination of trees, forage plants and livestock together as an integrated, intensively-managed system. The selection of suitable species of trees/shrubs, grasses, and legume for establishment of silivipastoral system depend on agroclimatic condition of the regions i.e., type of soil and rainfall in the region. This system is best suited for areas receiving <200 mm rainfall or for degraded rocky-gravelly areas. Silvipastoral

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systems having a three-tier canopy i.e., grass and legume (first tier), shrubs (second tier) and fodder-cum fuel trees (third tier) may be given high priority for improving the feed availability in arid region. Tree species highly compatible with grasses are: *Acacia senegal, Acacia tortilis, Albizia lebbek, Teehomella undulata, Colophospennum mopane, Dychrostachys nutans, Hardwclda binata, Ziziphus nummularia* and *Ziziphus rotundifolia*. Among the pasture legumes, *Clitoria ternatea* and *Lablab purpureus* showed good compatibility with grasses such as *Lasiurus sindicus* and *Cenchrus ciliaris.*

Conclusion

Recurrent calamities prevailing in one or the other parts of the country creating quantitative and qualitative deficiency of livestock feeds demand a policy to mitigate the nutritional deficiency effects in livestock which may include. Develop the feed resource base through establishment of feed /fodder banks based on early warning about drought from meteorological Department. Proper pasture grazing management methods to protect the biomass and ensure future production from the grasslands once the moisture and climate condition favours. Formulate nutrient supplementation policy to avoid loss of production and health. Conserve, utilize and enrich the feed resources from agricultural byproducts, forest grasses, tree leaves, bushes etc. as a drought proof measure.

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