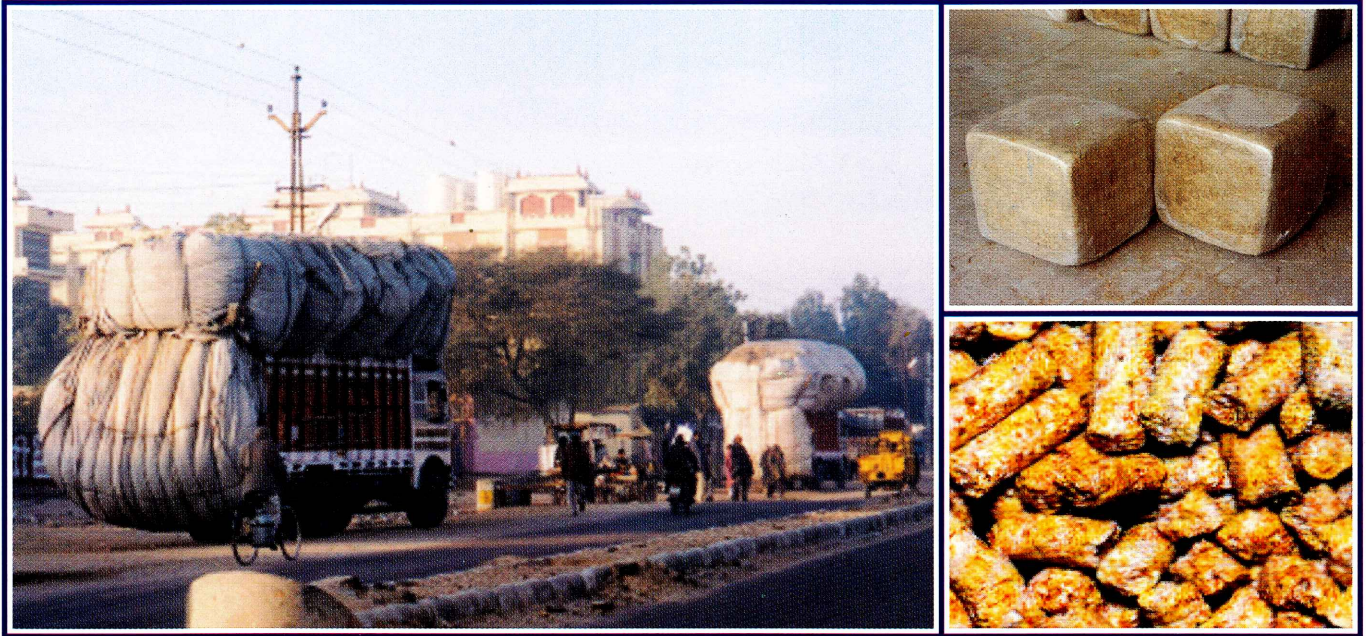


ENRICHMENT AND DENSIFICATION OF CROP RESIDUES



**Enriched & densified straw has better
nutritive value and can be transported and
stored economically**



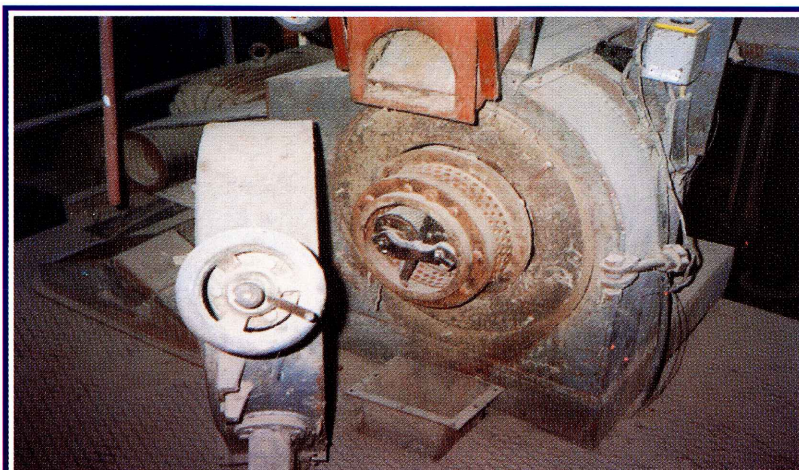
**NATIONAL DAIRY DEVELOPMENT BOARD
ANAND**

INTRODUCTION

Nutritive value of crop residues is low and these form the bulk of basal diet of ruminants in India. Crop residues are not uniformly available across the country, some areas are surplus and there is a severe deficiency in some of the areas. The farmers move these crop residues in traditional way from surplus to deficit areas. Since bulk density of straws is very low, their transportation cost is high and storage space requirement is also more, if these are handled in loose form. If crop residues are supplemented with low cost deficient nutrients and then densified, it is possible to save the transportation cost and storage space and at the same time nutritive value of straws can be improved for better growth and milk production. Different straws can be enriched and densified, depending up on their chemical composition and physical characteristics. After enrichment and densification, straws can be transported from surplus to deficit areas. Some of the technologies that have been standardized in India or elsewhere for handling different type of straws have been described here in brief.

STRAW BASED PELLETS

Straws that are highly lignified with hard fiber can be easily crushed and are considered to be more suitable for production of straw based pellets. Wheat, soybean and mustard are some of the straws that can be used for production of straw based pelleted feed, using flat die. The feed formulation may contain 30-35% crushed straw, 10-12% molasses, 35-40% DORB, 10-15% protein meal, 1% urea, 1% common salt, 1.5% calcite powder and 1% mineral mixture. The production cost of these pellets could be in the range of Rs.3.00 to 3.50 per kg, when the availability of straws and other feed materials is in abundance. If these pellets are fed 6-8 kg per animal per day, it is possible to support body maintenance and 3-4 litres of milk. There are large number of such pellet mills available in India with spare capacity, that can be used for production of straw based pelleted feed for the fodder deficit areas. It is possible to transport about 10-12 MT of such pellets in a truckload, shelf life more than a year. Cost of 30 MT per day straw pellet plant is about Rs. 40 lakh.



Straw based pellets



ENRICHED & DENSIFIED STRAW BALES

Straws that are having soft stem, with long stem can be chaffed to suitable length, sprinkled with deficient nutrients and can be baled with the mechanical device, as shown in the picture. Paddy straw is considered to be most suitable for production of this type of enriched bales. Bundles of paddy straw are cut in to 3-4 pieces and sprinkled with solution of molasses (10%), urea, minerals, common salt, 1% each, ensuring that the overall moisture does not exceed 15%. Cost of 8 MT per day machine is in the range of

Rs. 3 to 4 lakh and such enriched bales can be transported up to 6 MT in a truckload. This kind of enriched straw, if fed @ 5-6 kg, can support body maintenance of adult animals. These bales can be stored for more than a year.

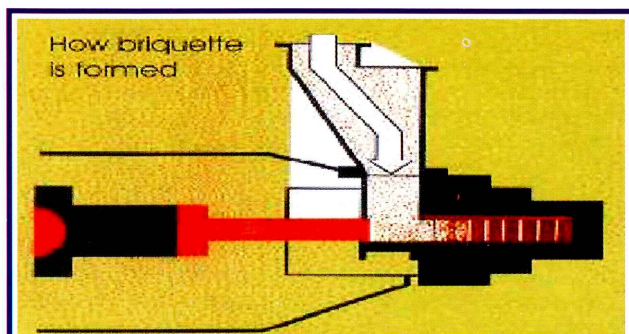
STRAW BASED BLOCKS

Feed blocks can be prepared from almost all types of crop residues after suitable processing. Block making unit comprises chopper, grinder, mixer and compactor and feed blocks of 5-25 kg can be manufactured, depending upon requirement. Formulation of block can vary, depending upon requirement. If blocks are required for meeting only maintenance requirement of animals, then the straw could be as high as 80% and concentrate ingredients up to 20%. However, if the feed blocks are required to



be produced for milk producing animals, then the straw component can vary from 30-50%, depending upon level of milk production. About 9-10MT of feed blocks can be transported in a truck and shelf life is more than one year, if the moisture content is kept below 11%. Approx. cost of block making plant of 15MT per day capacity is in the range of Rs. 25-35 lakh.

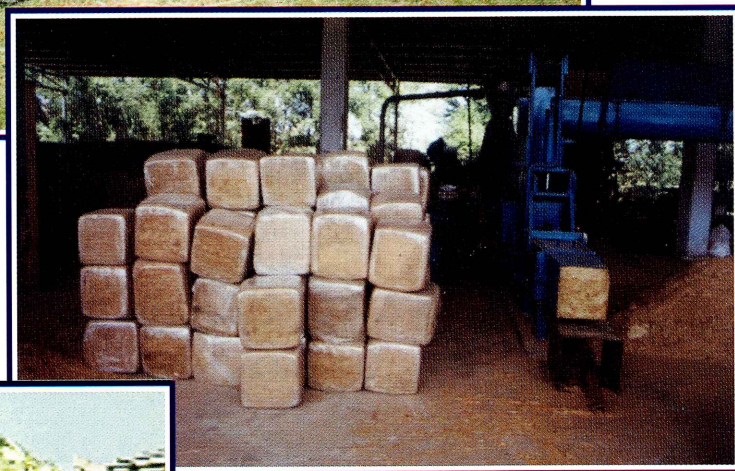
STRAW BASED BRIQUETTES



Hard and highly lignified straws such as wheat, soyabean, mustard, groundnut shell powder, cotton balls etc., can be briquetted along with 30-40% de-oiled rice bran. Large number of briquetting machines with surplus capacity are available in different parts of the country, that can be used for production of straw based briquettes. Straw based briquettes have very low moisture (always less than 6.0%) content and can be safely stored for several years. Briquettes thus produced can support maintenance requirement of animals, if fed @ 6-7 kg per animal per day. Bulk density of briquettes is very high and more than 12 MT briquettes can be transported in one truckload. It has been seen by the laboratory tests that the quality of straw and de-oiled rice bran does not deteriorate on briquetting. Briquettes are very hard and cannot be consumed by the animals, if offered as such. Small amount of water needs to be sprinkled on the briquettes, after putting them in the manger for dispersal of ingredients. Straw and other ingredients would soon disintegrate, which are consumed by the animals. About 5-10 MT per day straw based

briquettes can be produced on the briquetting machine, already available in India for production of white charcoal. Depending upon the capacity, cost of briquetting machine varies from Rs. 12-25 lakh and power requirement varies from 50-95 HP. During normal monsoon year, cost of briquetted feed ranges from Rs. 3.20-3.50 per kg.

ENRICHMENT-DENSIFICATION DEVICES & SOME PRODUCTS



MAIN BENEFITS OF ENRICHMENT & DENSIFICATION

- Bulk density of straws can be increased significantly.
- Nutritive value and palatability of crop residues can be improved through enrichment.
- Transportation cost of straws and stovers can be reduced.
- Storage space requirement of enriched and densified crop residues is 2-3 times less.
- Wastage of straws can be minimized.
- Through straw based feed blocks, it is possible to meet the macro and micro nutrient requirement of animals. Animals, thus, get balanced ration and there is improvement in productivity of animals on feeding straw based blocks.