INTRODUCTION

The socio-economic welfare of human population in India demands sound and efficient productive livestock; in-spite of the fact that mechanisation is fast occupying an important place in Indian agriculture, cattle still form the backbone of Indian agricultural economy. Moreover, the much needed nutritive feeds like milk and meat have to come from livestock population. The ill nourishment and under nourishment of Indian citizens can only be solved effectively through an improved livestock production.

Even in these conditions where the cattle population is still in an underdeveloped stage, they contribute significantly to national economy. According to Chaudri and Giri (1964) cattle contribute by way of milk and milk products about ₹ 759.60 crores.

For producing an efficient and economic type of productive cattle, animal husbandry workers have to concentrate on breeding, feeding and management. But breeding of good quality cows alone will not solve the problem unless due attention is given to its nutrition.
At present cattle are treated as scavengers, consuming what all human-beings discard to eat. They are allowed to graze on those lands where generally crops are not grown by cultivators. Apart from cows that are in milk, proper attention is not being paid to those animals which are in dry state, growing or pregnant. The negligence to feed properly all kinds of cattle is not because of unwillingness to provide good feeds to them, but because of non availability of suitable quality and quantity of feeds and fodders.

Most of the cattle are offered poor quality roughages which hardly form a subsistence ration. Some of the grasses that are available for feeding are of low nutritive values.

**Availability of fodder:**

The straws from paddy and wheat which constitute by far the largest amount (about 80 per cent) of the total organized fodder supply for the cattle in India are known to be poor in quality. Though from chemical composition they seem to contain some protein as well as fair amount of carbohydrates, yet only a small proportion of these nutrients are actually utilized because of their poor digestibility. The animals fed on these straws (particularly paddy straw) suffer from chronic deficiency of mineral constituents such as calcium and phosphorus (Sen et al 1942). Diuretic symptoms characteristic of paddy straw feeding are also noticed. This has been mainly attributed to the salts of oxalic acid present in paddy straw. Although inferiority of straws as a feed for cattle is well recognized, yet it is difficult to replace
the straws by better feeding stuffs in India. In agriculturally advanced countries, cereal straws do not ordinarily contribute more than a portion of roughages for livestock. In India, however, the cereal straws assume special significance in as much as they form the largest proportion of roughages, and most animals subsist on this alone. Tribe and Gordon (1950) held the view that the low voluntary intake of poor quality roughages was responsible for low productive efficiency of the animals. There is already a great shortage of green fodder for vast cattle population. Thirty two crores of cultivated land has to support about 55 crores of human and 22.5 crores of animals. Such a competitive situation has led to a shortage of about 33 per cent of fodder and about 60 per cent of concentrate requirements. Most of the milk at present being produced in India is from animals fed with straws and hay mainly, and a little rough grazing, plus an amount of concentrates which is increased in relation to the productivity of the animals and the demand for milk. This excessive reliance on concentrates can not be accepted as a permanent feature of the animal production industry, although it may be desirable to give serious attention to concentrates in the first instance (Whyte and Mathur 1968).

Although the food situation at present looks more encouraging, than for many years in the recent past, yet is is possible that this optimism may be premature. Of course there are indications that India has now the capacity to provide the
minimal food supply for the population and attention can now be given to improve the quality of human diets which normally means a change to consumption of some amount of livestock products. However, to keep pace with the increasing population, the dry fodders will continue to form the main ration in this country for a long time to come. But these straws alone can not form a ration of either maintenance or production until and unless the digestible energy can be increased by some physical, chemical or biochemical process.

**Impr. Q. v. 3 B. ieat. o£ the feeding value of coarse fodders.**

The problem of better utilization of crude fibre from coarse feeding stuffs has been a subject of study for last several decades in India and abroad. Alkali treatment of straws has been found by Sen et al. (1942) to improve the starch equivalent of the processed roughages to 36 per cent as compared to a value of 21 per cent in the untreated fodder. Moreover, the animals receiving the treated straw showed higher retention of nitrogen, indicating that the protein requirement could be met at a lower level of concentrate intake. Similar reports on the treatment of straws by alkali have been reported by Zubairy and Ayyar (1949); Wilson and Pidgen (1964); Godden (1920, 1942); Ferguson (1942, 1943); Hvidston (1958); Homb (1958) and Zaharjan (1962) employed carbide sludge for the alkali treatment. Elpatevskij (1962) favoured treatment of straws with quick lime and caustic soda. Dry chlorine has been found to be effective as a delignifying agent when passed
through ground roughages as reported by Sullivan and Hershberger (1959) and Barrero Gonzalez (1959). Kormsckov (1945) and Filatov (1958) recommended method of treating straws with lime; whereas Dam and Lakatos (1959) found that hydrolysis of straws with sulphuric acid enhanced their nutritive value.

The digestibility of cellulose from wheat straw when fed along with Berseem has been found to increase by Mudgal and Ray (1962). The later reports showed that berseem helped in the intake of higher dry matter, the digestibility of nutrients was also higher and total digestible nutrient content of the wheat straw could be increased provided ground nut cake or berseem is incorporated in the ration of wheat straw. The berseem supplementation also showed higher values for nitrogen, calcium and phosphorus, Mudgal et al. (1966).

Work carried out at Indian Veterinary Research Institute (1954-60) reveals that the natural high calcium present in the legumes counteracts the deleterious effect of paddy straw, provided legume was fed in adequate quantity (one kg bersee m hay/200 kg body weight).

Radiation treatment of fibrous feeds is a potential method of improving the nutritional value by making the carbohydrate more readily available to rumen microbes. However, there seems little likelihood that the high level of radiation required can ever be furnished at a cost to be economically feasible (International Atomic Energy Agency Vienna 1970- Technical Report No. 111).
Many workers have attempted to improve the feeding value of roughages by grinding and pelleting them. The gains in performance of the animals were attributed due to increased voluntary intake of dry matter. Minson (1962-1967; Meyer et al. 1959a, b); Ruvin Tro (1967) and Carrow et al (1967).

The only effective tool in the hands of animal nutrition workers that can yield immediate, cheaper and appreciable dividends seems to be the improvement of poor quality roughages as paddy straw and wheat straw by incorporating non-protein nitrogen substances.

An ancient but still economically attractive method, makes use of ruminants which can convert poor quality protein and non-protein nitrogen (NPN) to high quality protein for human food. This feature which is unique to ruminants among the food producing animals has prompted much optimistic speculations about the addition of NPN to protein deficient forages and fibrous trash to produce meat and milk. Few areas of ruminant nutrition have received as much attention as the utilization of NPN. Urea and other NPN compounds are of interest because they generally supply nitrogen at less cost than plant protein. Although many factors have been shown to affect the efficiency with which the ruminants utilize it, urea has been successfully fed with a wide variety of feeds and under a variety of production circumstances.

Bacteria, as a group show wide versatility in their ability to utilize different carbon and nitrogen sources for their
protoplasmic synthesis. Rumen microbes perhaps do not exhibit that much catholicity, but reports show that acetate - C (Hoover, Kesler and Flipse 1963) and CO₂ - C (Hungate 1966) can be utilized by rumen microorganisms.

The agricultural by-products such as straw, haulms, and trash are the most obvious source of cattle fodder which at present are wasted or used so improperly that they do not yield the food proportionately. However, the quantity available is enormous. Straw weigh more than the wheat or paddy grains and the tops and bagasse from sugarcane weigh upto 10 times as much as the sugar. But their nitrogen content is almost negligible. According to Pirie (1967) the manner in which each could be used as a feed when supplemented with urea is a separate research theme, for it can not be assumed that the technique found suitable for one will be applicable to the others.

However, feeding trials are necessary to evaluate the efficiency of NPN supplementation to diets poor in protein. Reproductive performance, growth and milk production of course being the ultimate and real yardsticks.

In our country dairy industry is making rapid strides. To cater the growing needs of large milk plants all over the country, a continuous flow of approved and high quality concentrate mixture is warranted for the milch cattle and buffalo in the milk shed areas. With the advent of modernization in
dairy field, it is but imperative to switch over to commercial manufacture of balanced and cheap concentrates for maintenance and production.

Keeping the foregoing background in view, it was, therefore, decided to take up the studies on "Enrichment of poor quality roughages by Non protein nitrogen" with the following objectives:

1. To improve the nutritive value of straws by incorporating NPN.
2. To formulate a compounded feed, using NPN over straw base.
3. To increase the overall utilization of poor quality roughages for cattle and buffalo.

Cow Versus Buffalo:

The controversy over the relative importance of the cow and buffalo in our national economy and future livestock development plans has been in existence for a substantially long time. It has been estimated that a little over 21.9 millions milch buffaloes contribute to about 59 per cent of the total milk produced in India as compared to the remaining 41 per cent produced by 45.5 million cows under the prevailing conditions (Amble et al 1964).

This fact becomes more pronounced when the composition of milk produced by the two species of animals is taken into consideration.
## Average yield and composition of milk of cows and buffaloes

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Particulars</th>
<th>Cows</th>
<th>Buffaloes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Milk production per year per animal (kg)</td>
<td>173.0</td>
<td>491.0</td>
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<tr>
<td>2.</td>
<td>Fat per cent</td>
<td>4.50</td>
<td>6.64</td>
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<tr>
<td>3.</td>
<td>Solid not fat per cent</td>
<td>9.25</td>
<td>9.92</td>
</tr>
<tr>
<td>4.</td>
<td>Total nitrogen per cent</td>
<td>0.58</td>
<td>0.62</td>
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</table>

The buffalo has maintained its own in India and Pakistan in spite of the fact that in India, cow has been well protected and considered to be a sacred animal. Harvey (1963) reviewed the importance of buffalo as farm stock and stated as "an animal which plays an intimate part in the life and work of millions of people in tropical and sub-tropical countries".

The livestock census (1961) revealed that the buffalo population increased by 13.9 per cent over the last census whereas the cattle population during the same period increased by 10.9 per cent (Chaudri and Giri 1964).

In the light of the differences seen in the physiological efficiency of cow and buffalo, it was thought desirable to study the comparative efficiency of the two species in utilizing roughages treated with NPN compounds.

Thus, it is expected that the present study will be very useful to help narrow down the wide gulf between the demand and supply of protein for our livestock. This will also throw light on the formulation of balanced and compounded feed by keeping straws as base for cattle and buffalo. It is likely to suggest the proper methodology of feeding NPN treated straws to the animals to derive maximum benefits of the nutrients from the straws.