Alternative feed and fodder resources for feeding of Dairy cattle and buffaloes

Dr. E. RAGHAVA RAO
NTR College of Veterinary Science
Gannavaram 7 1 2004
More Attention to Nutrition

- **Water** – 6.5 L/Kg DMI, 15 L/100 Kg B Wt.

- **DM Intake** – Palatability (2 kg/100 kg BW for maintenance; up to 3 kg/100 kg BW for high yielders)

- **Protein** – 2.48 g/Kg W^{0.75} (132 g/100 g of milk protein)

- **Energy** – 122 Kcal of ME Kg W^{0.75} (1188)

- **Minerals and Vitamins**
ROUGHAGES

- Green fodders (SCT), Tree leaves, shrubs
- Silage
- Dry roughages

**Cereal straws** - Paddy straw, Jowar, Bajra, Ragi, Maize stover etc.

**Pulses straws** – Green gram, Black gram, Bengal gram, Cow pea, Groundnut haulms, sun hemp hay etc.

**Others** – Maize cobs, Sunflower heads, Fruit industry wastes
CONCENTRATES

- Cereal grains
- Milling by-products (*Brans, Chunnies etc.*)
- Oilseed meals
- Agro-industrial by-products

Molasses, Brewery waste, Maize Spent Liquor, DDGS, Maize husk, Tapioca waste etc.
Non Conventional Fibrous Resources

- Agro-Industrial by-products
  Sugarcane tops, Sugarcane trash, Palm Press fibre, POME, Sun flower heads, Milling byproducts etc.
Approximate Amounts of Principal Products and By-products from the oil Palm Plant at Maturity

FRESH FRUIT BUNCHES

- Bunch Trash: (55 – 58%)
- Palm Press Fibre: (12%)
- Palm Oil: (18-20%)
- Palm Kernels: (4 – 5%)
- Palm nut shells: (8%)

- Palm oil sludge: (2 % dry)
- Palm kernel Oil Cake: (45 %) (45%)

- Devendra, 1977
## UTILIZATION OF OPBP IN LIVESTOCK DIETS

<table>
<thead>
<tr>
<th>Livestock</th>
<th>PKC</th>
<th>OPF</th>
<th>POME</th>
<th>PPF</th>
<th>P. OIL</th>
<th>OPT</th>
<th>% IN DIET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>90</td>
<td>55</td>
<td>40</td>
<td>35</td>
<td>5</td>
<td>35</td>
<td>90</td>
</tr>
<tr>
<td>Buffalo</td>
<td>90</td>
<td>55</td>
<td>40</td>
<td>35</td>
<td>5</td>
<td>35</td>
<td>90</td>
</tr>
<tr>
<td>Goat</td>
<td>50</td>
<td>50</td>
<td>15</td>
<td>15</td>
<td>5</td>
<td>25</td>
<td>80</td>
</tr>
<tr>
<td>Sheep</td>
<td>50</td>
<td>50</td>
<td>15</td>
<td>15</td>
<td>5</td>
<td>-</td>
<td>80</td>
</tr>
<tr>
<td>Poultry</td>
<td>20</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>40</td>
</tr>
<tr>
<td>Pig</td>
<td>25</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>45</td>
</tr>
<tr>
<td>Rabbit</td>
<td>25</td>
<td>50</td>
<td>10</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>60</td>
</tr>
</tbody>
</table>

*Dahlan Ismail, 1996*
## Chemical composition of OPBP

<table>
<thead>
<tr>
<th>Constituent</th>
<th>PKC</th>
<th>PPF</th>
<th>POME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein</td>
<td>19.00</td>
<td>08.02</td>
<td>09.6 – 16.0</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>16.00</td>
<td>41.12</td>
<td>11.1 – 25.8</td>
</tr>
<tr>
<td>Ether Extract</td>
<td>02.00</td>
<td>09.04</td>
<td>11.8 – 25.9</td>
</tr>
<tr>
<td>Total ash</td>
<td>04.20</td>
<td>09.60</td>
<td>15.1 – 25.3</td>
</tr>
<tr>
<td>NFE</td>
<td>58.80</td>
<td>32.22</td>
<td>07.0 – 52.4</td>
</tr>
<tr>
<td>Ca</td>
<td>0.34</td>
<td>0.65</td>
<td>0.57 – 3.81</td>
</tr>
<tr>
<td>P</td>
<td>0.69</td>
<td>0.21</td>
<td>0.002-0.18</td>
</tr>
<tr>
<td>Mg</td>
<td>0.16</td>
<td>0.17</td>
<td>0.09 – 0.49</td>
</tr>
<tr>
<td>Gross energy (MJ/Kg)</td>
<td>17.30</td>
<td>20.40</td>
<td>14.6 – 24.8</td>
</tr>
<tr>
<td>Availability (Approx.) (4 lakh Ha)</td>
<td>6.86 MT</td>
<td>4.59 MT</td>
<td>8.26 MT</td>
</tr>
</tbody>
</table>
## Cell-Wall constituents of PPF

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDF</td>
<td>72.48</td>
</tr>
<tr>
<td>ADF</td>
<td>53.09</td>
</tr>
<tr>
<td>Hemicellulose</td>
<td>19.39</td>
</tr>
<tr>
<td>Cellulose</td>
<td>33.64</td>
</tr>
<tr>
<td>Lignin</td>
<td>18.46</td>
</tr>
<tr>
<td>Silica</td>
<td>3.68</td>
</tr>
</tbody>
</table>
Average Milk Yield and composition of Lactating Murrah Buffaloes on PPF based diets

<table>
<thead>
<tr>
<th>Group</th>
<th>Milk Yield (Kg)</th>
<th>Fat %</th>
<th>Fat Yield (Kg)</th>
<th>4 % FCM</th>
<th>SNF %</th>
<th>Total solids</th>
<th>Av. Feed cost / Kg milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 PS</td>
<td>6.62</td>
<td>6.88a</td>
<td>0.44</td>
<td>9.25</td>
<td>9.76</td>
<td>16.65a</td>
<td>3.19</td>
</tr>
<tr>
<td>2 PPF</td>
<td>6.64</td>
<td>6.87a</td>
<td>0.46</td>
<td>9.56</td>
<td>9.83</td>
<td>16.70a</td>
<td>2.64</td>
</tr>
<tr>
<td>3 UPPF</td>
<td>6.65</td>
<td>8.08b</td>
<td>0.53</td>
<td>10.65</td>
<td>10.12</td>
<td>18.23b</td>
<td>1.97</td>
</tr>
<tr>
<td>4 UPPF+GF</td>
<td>7.48</td>
<td>8.27b</td>
<td>0.55</td>
<td>10.98</td>
<td>10.11</td>
<td>18.38b</td>
<td>2.00</td>
</tr>
</tbody>
</table>

*a,* *b* Values bearing different superscripts column-wise differ significantly (*P*<0.05)

Prasanna Kumar *et al.,* 1999
## On-Farm Evaluation - Economic gain achieved by the technology adopter – PPF Feeding

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Content</th>
<th>Adopter</th>
<th>Non-adopter</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Milk Yield (kg/day)</td>
<td>5.30</td>
<td>4.56</td>
<td>0.74</td>
</tr>
<tr>
<td>2.</td>
<td>Fat %</td>
<td>8.1</td>
<td>6.5</td>
<td>1.6</td>
</tr>
<tr>
<td>3.</td>
<td>Milk price (Rs./kg)</td>
<td>16.20</td>
<td>13.0</td>
<td>3.20</td>
</tr>
<tr>
<td>4.</td>
<td>Economics (Rs./day)</td>
<td>85.86</td>
<td>59.28</td>
<td>26.58</td>
</tr>
</tbody>
</table>
Utilization of POME in the Concentrate Mixtures of Buffalo calves

Variation of bodyweights in experimental buffalo calves

CM-I – Concentrate mixture comprising 30% POME
CM-II – Concentrate mixture comprising 40% POME
CM-III – Concentrate mixture comprising 50% POME
CM-IV – Control concentrate mixture
### Composition of concentrate mixture fed to Buffalo calves

<table>
<thead>
<tr>
<th>S. No</th>
<th>Ingredient</th>
<th>CM1</th>
<th>CM-II</th>
<th>CM-III</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dehydrated POME</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>-----</td>
</tr>
<tr>
<td>2</td>
<td>Palm Kernel Cake (PKC)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Sunflower Cake</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Gingely Oil Cake</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Wheat Bran</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>Maize</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>7</td>
<td>Urea</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>8</td>
<td>Mineral Mixture</td>
<td>02</td>
<td>02</td>
<td>02</td>
<td>02</td>
</tr>
<tr>
<td>9</td>
<td>Salt</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>10</td>
<td>Green gram Chunni</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>25</td>
</tr>
<tr>
<td>11</td>
<td>Rice Bran</td>
<td>20</td>
<td>10</td>
<td>-----</td>
<td>20</td>
</tr>
</tbody>
</table>
### MILK COMPOSITION OF LACTATING BUFFALOES FED POME BASED CONCENTRATE MIXTURES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Lactating buffaloes fed on concentrate mixtures containing POME</th>
<th>Lactating buffaloes under control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average daily milk yield (Kg)</strong></td>
<td>8.92 ± 0.95</td>
<td>7.28 ± 0.45</td>
</tr>
<tr>
<td><strong>Average fat (%)</strong></td>
<td>7.51 ± 0.20</td>
<td>7.78 ± 0.22</td>
</tr>
<tr>
<td><strong>Total solids (%)</strong></td>
<td>17.37 ± 0.24</td>
<td>17.27 ± 0.26</td>
</tr>
<tr>
<td><strong>Protein</strong>   <strong>(%)</strong></td>
<td>3.77 ± 0.03&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.46 ± 0.03&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>SNF</strong>   <strong>(%)</strong></td>
<td>9.86 ± 0.26&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9.48 ± 0.22&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>4 % FCM produced / day (Kg)</strong></td>
<td>9.69 ± 0.23&lt;sup&gt;b&lt;/sup&gt;</td>
<td>7.89 ± 0.95&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Feed efficiency</strong> (Kg DM consumed / Kg milk produced)</td>
<td>1.13 ± 0.12</td>
<td>1.15 ± 0.09</td>
</tr>
<tr>
<td><strong>Cost/ Kg concentrate mixture (Rs.)</strong></td>
<td>7.50</td>
<td>10.00</td>
</tr>
<tr>
<td><strong>Cost of concentrate mixture + roughage / Kg milk production (Rs.)</strong></td>
<td>4.37 ± 0.42&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.71 ± 0.35&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Maize stover
Feeding of buffaloes with Maize stover based complete diets
Average milk yield and milk constituents of buffaloes conventional and complete ration during on-farm lactation trial

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conventional ration</th>
<th>Complete ration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk Yield (Kg)**</td>
<td>6.02 ± 0.13</td>
<td>6.73 ± 0.10</td>
</tr>
<tr>
<td>Milk Fat (%)**</td>
<td>5.30 ± 0.05</td>
<td>5.71 ± 0.08</td>
</tr>
<tr>
<td>6 % FCM (%)**</td>
<td>5.53 ± 0.10</td>
<td>6.51 ± 0.12</td>
</tr>
<tr>
<td>Butter Fat Yield (g)**</td>
<td>318.20 ± 5.82</td>
<td>384.41 ± 8.34</td>
</tr>
<tr>
<td>SNF (%)**</td>
<td>8.59 ± 0.02</td>
<td>8.79 ± 0.04</td>
</tr>
<tr>
<td>TS (%)**</td>
<td>13.89 ± 0.06</td>
<td>14.50 ± 0.11</td>
</tr>
<tr>
<td>Protein (%)**</td>
<td>3.60 ± 0.06</td>
<td>3.79 ± 0.06</td>
</tr>
<tr>
<td>Casein (%)**</td>
<td>2.79 ± 0.05</td>
<td>2.96 ± 0.04</td>
</tr>
</tbody>
</table>
Hydroponic Maize Fodder
Supplementation of Hydroponic Maize Fodder to Milch Buffaloes
## Effect of supplementing Hydroponic Maize fodder on Milk yield in Murrah Buffaloes

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk Yeild</td>
<td>12.15 ± 1.94</td>
<td>12.44 ± 0.82</td>
</tr>
<tr>
<td>Fat %</td>
<td>7.64 ± 1.14</td>
<td>7.53 ± 0.73</td>
</tr>
<tr>
<td>6%FCM</td>
<td>14.30 ± 1.81</td>
<td>14.53 ± 0.40</td>
</tr>
<tr>
<td>SNF %</td>
<td>9.42 ± 0.14</td>
<td>9.38 ± 0.11</td>
</tr>
<tr>
<td>TS %</td>
<td>17.06 ± 1.27</td>
<td>16.75 ± 0.99</td>
</tr>
<tr>
<td>MILK LACTOSE</td>
<td>4.84 ± 0.02</td>
<td>4.82 ± 0.04</td>
</tr>
<tr>
<td>PROTEIN</td>
<td>3.87 ± 0.06</td>
<td>3.94 ± 0.07</td>
</tr>
<tr>
<td>CASEIN</td>
<td>3.01 ± 0.05</td>
<td>3.06 ± 0.05</td>
</tr>
<tr>
<td>Butter fat yield (g/D)</td>
<td>916.69 ± 122.13</td>
<td>931.00 ± 40.71</td>
</tr>
</tbody>
</table>

eraghava
Grouping herds by level of production also may result in efficient use of milking parlour since groups should be milked out more uniformly and at similar times.
• The reproduction checks, breeding and pregnancy checks will tend to be concentrated in the higher producing groups to improve breeding efficiency of the herd simultaneously.
LOOSE HOUSING SYSTEM
Stall Feeding – Feed Manger
**Nutritional Strategies**

for Feeding the High-Producing Cow / Buffalo *(Contd…)*

- High–producing dairy animals should eat **3.6-4.0** percent of their body weight or more daily as dry matter.
- If a herd is consuming **less** dry matter than 3.5-4.0 percent of body weight, production of solids-corrected milk may be limited.

**Major feeding factors which affect feed intake include:**

- **Feed manger** management (keep them clean, shaded during hot weather and adequate space per animal).
- **Feeding frequency** and sequence – increased feeding frequency may **increase fat test**, especially with diets which are **low-fiber** and high in grain. The greatest response is seen in diets with less than 45 percent forage or when grain is fed separately, as in parlour feeding. When diets are fed as total mixed rations, feeding frequency is not as important, as long as feed remains palatable, fed at least once daily and frequently used up.
- **Social interactions** (“**boss**” cow problems when heifers and mature cows are mixed together in one group).
- **Sudden ration changes.**
- **Proper flooring, bedding or ventilation** (animal comfort).
High quality forage is necessary for a proper lactating cow’s ration. **Legume (alfalfa) forage.**

Many byproducts such as dried distillers grains, whole cottonseed, by-products of milling industry (*chunuries*, *brans*) may prove to be valuable alternatives.

Diets containing high levels of grain (more than 50% in total ration) may cause metabolic disturbances such as rumen acidosis, and may ultimately result in lameness and low milk fat production. To avoid these problems, energy may also be added to the diet by feeding fat.

High producing cows and buffaloes, especially in early lactation (the first 120 days), are typically in negative energy balance.

In early lactation, the dairy cow/buffalo is able to **mobilise fat reserves** to produce more milk than could otherwise be achieved from nutrients derived in feed consumed. Due to fat’s higher density, **incorporating fat into rations** may be a successful way to get more energy into the cow with the **same feed volume**. This is one approach to meet the energy requirements of higher milk production without the negative metabolic effects associated with high grain feeding.

However, the **wrong kind or amount of added fat** can create negative metabolic problems. Fatty acids are not fermentable and as a consequence are not a source of energy to rumen microbes.
Energy (Contd…)

Unsaturated fats are soluble in rumen fluid and may inhibit rumen fermentation and fiber digestion. Therefore, supplemental vegetable fats may serve as problematic in most dairy rations, especially when whole soybeans, cotton seeds, distillers grains or sunflower seeds are being fed. However, saturated fats such as tallow generally are insoluble in rumen fluid, have little negative impact on rumen fiber digestion, and offer the most potential to supply energy for milk production.

Feeding fat sources with high levels of oleic acid (unsaturated fat) appears to exceed the ability of rumen microbes to saturate fat. This may affect rumen microbial fat digestion and also may depress milk fat test.

In some cases feeding supplemental fat has been shown to decrease milk protein by 0.1 percent or more.

Calcium salts of Long Chain Fatty Acids (Ca-LCFA) are such a source of ruminally inert LCFA and have been shown to increase milk production by dairy cows when used as a feed supplement (Palmquist, 1984).
Sources of Supplemental Fat

- Three basic types of supplemental fat currently available include:
  - Vegetable fats or oils (high in unsaturated fats);
  - Animal fats (high in saturated fats); and
  - Ruminally inert, protected (by pass) commercial fat sources.

- Ruminally protected fat sources which are commercially available escape fermentation and exert little negative effect on rumen fiber digestion.
- Megalac, one example of a commercial fat source, is a calcium salt of long chain fatty acids of palm oil. Energy Booster is primarily palmitic and stearic acids.

Generally recommended guidelines for feeding of fat:

<table>
<thead>
<tr>
<th>Source</th>
<th>Maximum percent of Ration Dry Matter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forages, grains (basal diet)</td>
<td>3 percent</td>
</tr>
<tr>
<td>Natural fats</td>
<td>2 to 4 percent</td>
</tr>
<tr>
<td>Whole oil seeds</td>
<td>&lt; 500 g</td>
</tr>
<tr>
<td>Tallow</td>
<td>&lt; 500 g</td>
</tr>
<tr>
<td>Protected Fats eraghava</td>
<td>2 percent</td>
</tr>
<tr>
<td>Total</td>
<td>7 to 8 percent maximum</td>
</tr>
</tbody>
</table>
Some important aspects to be considered while feeding supplemental fat

- High producing cows (> 9,000 kg per lactation) have the greatest potential need for supplemental fat, usually through the first 120 days of lactation.
- To minimize depression in milk protein percentage, balance rations carefully for starches and sugars to maintain normal rumen fermentation.
- Add fat gradually to rations over two to three weeks to overcome any palatability problems.
- If the ration ether extract level is over 5 percent, the unsaturated fatty acid levels should be evaluated and a protected fat source should be considered.
- The higher the ration fiber levels, the more fat can be fed to dairy cattle.
- Added fat may decrease fiber digestion and dry matter intake if not used properly. Be certain to maximize forage intake by feeding high quality forages. The level of neutral detergent fiber in the diet should be approximately 28 percent of ration dry matter.
- The level of calcium should be increased to 0.9 percent to 1.0 percent and magnesium increased to 0.25 to 0.30 percent of ration dry matter compared to rations without added fat, to counteract soap formation and loss of these minerals in the faeces.
- Be sure to meet the cow’s requirements for crude protein, rumen undegradable protein and nonfiber carbohydrates (starches and sugars).
- Niacin, fed at 6-12 grams per day, may correct the milk protein depression seen with high levels of fat feeding.
Protein

The **crude protein** content of the total diets that is required for high levels of milk production (i.e. > 40 kg/d) may exceed **16 percent** (DM basis) to feed to the requirements suggested by NRC, 2001 and ICAR, 1998.

Of this usually **35 to 40 percent** should be **undegradable** in the rumen to maximize protein utilization and amino acid supply to the animal.

* Common sources in **bypass protein** include **heat treated soybeans or soybean meal, cottonseed meal, distiller’s grains, fish meal etc.** **Solvent extracted cotton seed meal** protein appears to be about **75 % protected** from rumen degradation (Leng et al., 1984).

Meeting the dairy cow’s protein requirements – both crude and escape – is essential to maintain normal milk protein test. For a 575 kg weighing cow producing 4 percent milk fat, crude protein requirements range from **15 percent** for **20 kg of milk** to **18 percent** for cows producing **50 kg of milk**.

For cows in early lactation (90 to 120 days in milk), the amount of escape protein should range from 33–40 percent (as a percent of crude protein) to maintain normal milk protein levels.

**Overfeeding crude protein may also result in excessive nitrogen excretion and environmental pollution.**

Generally, dietary crude protein concentration affects milk yield, but not milk protein percentage, unless the diet is deficient in crude protein. Also feeding excessive degradable crude protein, such as urea, can reduce milk protein. Generally limit urea feeding to cows past 120 days in milk. Urea should make up only 1-2 percent of the concentrate mixture to maintain palatability.

eraghava
Minerals

The mineral needs of the milch animals can be met either through mineral mixture, salt licks or through organo-mineral complexes. Dairy cows are more prone to mineral deficiencies due to their increased requirement for lactation.

As most of the agricultural crop residues have low mineral content, it is necessary to supplement adequate levels of minerals.

Exclusive feeding of cattle with sugarcane tops resulted in negative calcium and phosphorus balances and was overcome with the feeding of 50 g of ‘Di-calcium Phosphate’ per head per day.

In order to reduce the cost of mineral supplementation, it is possible to supplement with ingredients that are relatively rich in these minerals. For example legume fodder, top feeds and cultivated fodders are very good sources of calcium, zinc and iron. Similarly milling by-products like rice bran, wheat bran, rice polish and oil seed meals (cakes) have been found to contain high levels of phosphorus and could be good source of supplementing this mineral (Prasad, 2001).

Generally, trace minerals are being supplemented to animal diets as inorganic salts. In recent years, there has been considerable interest in the use of chelated or organic trace minerals in ruminant diets to take care of the increased demand of high producing milch animals. Increased milk production and decreased somatic cell count have been observed in lactating dairy cows fed zinc-methionine. Further zinc-methionine has been recommended for prevention of foot rot and other hoof problems associated with high milk producers. Improvement in reproductive performance was also observed due to supplementation of organic forms of zinc and manganese.
Feed Additives

Several feed additives like yeast and other probiotics are being used to relieve the milch animals from stress resulted due to higher productivity by increasing nutrient utilization.

By naturally boosting the population of beneficial rumen bacteria, Yea-Sacc® 1026 helps ruminant animals achieve their full potential—cost effectively—through better utilization of feed.

It reduces digestive disorders, drives dry matter intake, improves feed efficiency, increases milk yield, improves milk composition (Deney et al., 2007).
HYBRID NAPIER – APBN-1
GUINEA GRASS – MOMBASA

Mombassa
Yield/ha - 150-180 t
DM Yield/ha - 40 t
Protein - 13.74%

MOMBASSA GUINEA
BUFFALO RESEARCH STATION
Venkata Ramanna Gudem, West Godavari District (A.P.)
GUINEA GRASS – TANZANIA
RAIN GUN IRRIGATION OF FODDER CROPS

RAIN GUN IRRIGATION OF THE FODDER GRASS
BUFFALO RESEARCH STATION
Venkata Ramanna Gudem, West Godavari District, A.P
CHAFFING OF GREEN FODDER
Mechanical Harvesting of Perennial Fodders
SUN HEMP GROWN AS INTER CROP IN SAPOTA ORCHARD
Intercropping of Sunhemp in Mango
Silvi-Pasture System
Thank you