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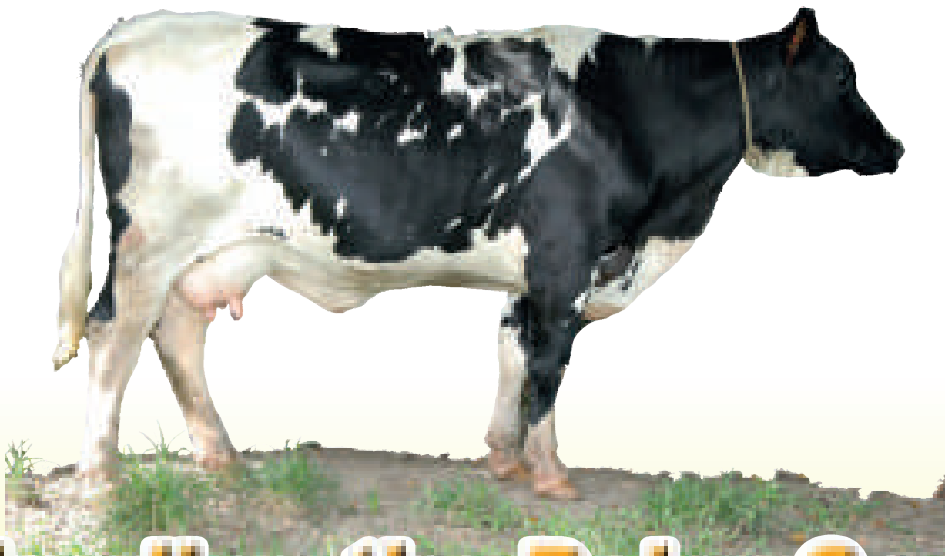
Ministry of Agriculture, Land & Fisheries



Extension Training and Information Services Division

Technical Bulletin

TT: AgExt./TB:16:05



Feeding the Dairy Cow

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Extension Training and Information Services Division
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INTRODUCTION

Dairy cows are reared for milk production. Milk is high in calcium and is an important food source for children. Feeding the animal right plays a major role in the quantity and quality of milk produced.

Protein, fats, fibre, water, vitamins and minerals are some of the main ingredients that must be provided in the diet of dairy cows.

This technical bulletin deals with the feeding of the dairy cow at the various physiological stages. These stages are:

- Calf (birth to 3 months)
- Heifer (3 - 15 months)
- Pregnant heifer (270 - 295 days)
- Lactating cow (produces milk for 305 days)
- Dry cow (approximately 2 months)

FEEDS

The animal acquires its nutrient requirement from two different sources:

- **Forage**
- **Concentrate feeds (protein and energy)**

Forages

Forages are plant materials which can be grown for feeding ruminants and can be fed freshly cut, ensiled or dried. They are excellent sources of protein, carotene, calcium, and other minerals. High quality forages fed in balanced rations will supply much of the protein and energy needs for milk production.

Feeding forages can reduce the need for costly supplements. To achieve optimum production from forage-based rations, the nutrient content of the forage must be known and good agronomic practices must be done to obtain maximum yield and quality of cultivated forages. Forages recommended for feeding animals are: grasses, legumes and other forages.

* **Grass forages** for example Mulato (figure 1a) (*Brachiaria spp.*), Tanner (*Brachiaria arrecta*) (figure 1b) and Elephant Grass (*Pennisetum purpureum*).



Figure 1a: Mulato grass



Figure 1b: Tanner grass

* **Legume forages** for example, Leucaena (*Leucaena leucocephala*), Gliricidia (*Gliricidia sepium*) (figure 2) and Kudzu (*Pueraria lobata*).



Figure 2: Gliricidia

* **Other Forages**, for example, Trichantera (*Trichantera gigantea*) [figure 3a] and Mulberry (*Morus spp.*) [figure 3b].



Figure 3a: Trichantera (*Trichantera gigantea*)



Figure 3b: Mulberry (*Morus spp.*)

Concentrate Feed

Concentrate feeds usually refer to high quality, low fibre feeds and include cereal grains, milling by-products, protein sources and fats. Concentrates are very digestible and provide the animal with a lot of readily available energy which is derived mostly from starches, sugars, other carbohydrates and fats or oils. Concentrate feeds are used to supplement nutrients that forages alone cannot provide to the dairy cow.

Concentrates can be commercially blended products and these are described as premixed rations/dairy rations (figure 4). These rations are blended with different levels of crude protein as illustrated in (*Table 1*).



Figure 4: Concentrate feed

Table 1: Examples of Commercial Formulations for Dairy Cattle

Commercial Ration	Crude Protein (CP %)	Fat %	Fibre %
14 % Pellet/Mash	14	2.50	7
16 % Pellet/Mash	16	2.50	7
18 % Pellet/Mash	18	2.50	7

These varying levels of crude protein can be fed at different physiological stages of the animal's life.

Mineral Lick or Block

Commercially available **mineral licks or blocks** (figure 5) should be used to supplement all the required vitamins and minerals for proper health and functioning of the animal. This should be provided to the animal during pregnancy and milking when there is a great demand for nutrients. They come in many shape and forms.



Figure 5: Mineral licks blocks (Salt lick)

FEEDING

A combination of concentrate feed and forage should be fed to the animal from two weeks of age. The amount varies depending on the different stage of development of the animal. Clean, fresh water should be provided at all times.

Feeding the Calf from Birth to Weaning (3 months)

Ensure that the calf receives colostrum within half an hour of birth. Colostrum is the first milk produced by the cow. It is rich in vitamin A and contains antibodies that help to build up resistance against diseases. Bottle feed the calf colostrum for 3 days to ensure it receives sufficient quantities of colostrum.

In cases where colostrum is not available, artificial colostrum can be prepared by mixing 3 litres **whole milk**, 1 litre **warm water**, 1 teaspoon **cod liver oil**, 2 teaspoons **castor oil** and 1 raw **egg** in a clean container. **Feed immediately after preparation to avoid spoilage.**

Feed with a commercially available milk replacer from day 4 until 12 weeks of age. A commercial calf ration containing a minimum of 18 % crude protein and forage should also be offered from week 2 (*Table 2*).

Table 2: Feeding Requirements for the Calf (birth to three months)

Age of Calf	Milk Replacer (litres/day)	Dairy Ration 18 % Pellet/Mash (kg/day)	Forage (ad lib)	General Remarks
1 - 3 days	Nil	Nil	Nil	1/2 hour suckling twice per day will provide approx. 3.4 - 4.0 litres of colostrum for the calf
4 - 7 days	4	Nil	Nil	
Week 2	4	0.25 (0.55 lbs)	Offer freshly cut grass	Feeding grass at this stage helps to develop the calf's rumen
Week 3	5	0.4 (0.88 lbs)		
Week 4	6	0.55 (1.21 lbs)		
Week 5	6	0.7 (1.54 lbs)		
Week 6	8	0.85 (1.87 lbs)	Allow calf to graze on pasture on mornings and evenings	The calf starts to learn how feed on her own out in the pastures and gets much needed exercise
Week 7	8	1 (2.2 lbs)		
Week 8	8	1.2 (2.64 lbs)		
Week 9	6	1.4 (3.08 lbs)		
Week 10	5	1.6 (3.52 lbs)	Allow calf to graze on pasture on mornings and evenings	The average target weight at 3 months should be 91 - 100 kgs.

Feeding the Heifer (3 - 15 Months Old)

During this period of the heifer's life, forage should be fed freely with supplemental feeds. Forages however, cannot be expected to supply all of the nutrients for calves at this age. The quality of the forage used will determine the type and amount of concentrate that should be supplemented.

A mineral lick should also be provided to ensure that the animal receives adequate minerals for proper development in preparation for breeding. The target weight gain during this period is 0.5 - 0.7 kg per day in order to reach 150 kg at 6 months. A 16 % dairy ration should be provided if forage quality is not high.

This should be able to sustain proper growth and development.

The expected weight at 15 months old should be 250 - 300 kgs. At this age and weight, the heifer should be bred when signs of heat are detected (figure 6).



Figure 6: Mature heifer

Feeding the Pregnant Heifer (15 - 24 Months Old)

Once the heifer has conceived, it will calve in 9 months. Calving is the act of giving birth by cows. Heifers should be gaining 0.7 - 0.9 kg per day. Good quality forages should be the only feed required for heifers over 1 year of age.

If the desired growth is not satisfactory, a small amount of concentrate feed should be supplied. A dairy ration of 16 % Crude Protein may be fed to the pregnant heifer if forage quality is not high. **Table 3** describes how you should feed the pregnant heifer until calving.

Table 3: Feeding the Pregnant Heifer

Age of Pregnant Heifer	Dairy Ration (kg/day)	Forage (ad lib)	General Remarks
15 - 22 months	16 % Pellet/Mash as required	Good quality forage	Average daily weight gain during this period should be 0.7 to 0.9 kg
6 - 8 weeks before calving	16 % Pellet	Good quality forage	Feed ration at 1 % of body weight

Feeding the Lactating Cow

Lactation is the production of milk by the animal. It begins immediately after calving and should last for 10 months. The cow must be milked twice per day to ensure maximum milk extraction. The average dairy cow in Trinidad and Tobago produces 8 - 12 kg of milk per day. Feed requirements vary with the stage of lactation and the number of pregnancies (e.g. first, second and third pregnancy).

Three distinct feeding phases can be defined to attain optimum production and health of lactating dairy cows.

These are early lactation, mid lactation and late lactation. **Table 4** shows how to feed the animal at these stages and **Table 5** shows the relationship between the amount of concentrates fed and the amount of milk produced.

Table 4: Feeding the Lactating Cow

Stage of Lactation	Type of Ration	Forage (ad lib)	General Remarks
Early Lactation (1 - 10 wks)	18 % Pellet	Good quality forage	Milk production is highest during this period peaking at 6 - 8 weeks. The animal should be bred at 10 weeks after calving.
Mid Lactation (peak feed intake) (11 - 20 wks)	16 % Pellet/Mash (Must not exceed 4 % of body weight)	Good quality forage	Milk production remains steady and then slightly declines over time.
Late Lactation (21 - 44 wks)	14 % Pellet/Mash	Good quality forage	Milk production declines gradually. Milk once per day in the last week. All existing milk must be removed from the cow's udder to prevent mastitis.

Table 5: Relationship Between Feeding Concentrates and Milk Production

Milk kg/day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Concentrates kg/day	0.4	0.9	1.3	1.8	2.2	2.7	3.1	3.6	4	4.4	4.9	5.3	5.8	6.2	6.7	7.1	7.6	8	8.4	8.9

Table 5 represents a general guide for supplementing concentrate feed, providing that good quality forage is used. For every kg of milk produced the animal should be fed approximately 0.45 kg (1 lb) of ration.

Early lactation (1 - 10 weeks)

Milk production increases rapidly during this period, peaking at 6 to 8 weeks after calving.

Feed intake during this period is reduced because the animal loses its appetite and eats less. As a result the cow uses some of its body fat stored to produce milk and loses weight in the process.

Increasing the nutrient intake during this period is, therefore, a very important management practice.

Increasing supplemental feed by 0.5 kg per day after calving will increase nutrient intake while minimising off-feed problems and low rumen pH. Protein is a critical nutrient during early lactation. Meeting or exceeding protein requirements during this period helps to increase feed intake and allows the cow to use its body fat stores more efficiently for milk production.

To increase nutrient intake:

- Feed high protein forages
- Increase supply of concentrate at a constant rate after calving
- Allow constant access to feed
- Minimise stress conditions

Mid lactation (11 - 20 weeks)

The main target in this period is maintaining peak milk production for as long as possible. The amount of feed to be given should be equivalent to 4 % of the cow's body weight. This can be achieved by feeding high protein forages ad lib and continuing to minimise stress conditions. Ad lib means ensuring feed is always available.

At this stage the cow should be gaining weight slightly since its appetite should be back to normal. It should be consuming more feed and this would be used for producing milk.

There is no longer a need for the cow to use her own body fat stores for milk production. Potential problems during this period include a rapid drop or decline in milk production, low milk fat, silent heat (no observed heat), and ketosis.

Late lactation (21 - 44 weeks)

As recommended in Table 4, the animal should be bred at 10 weeks after calving and therefore should be pregnant. Milk production at this stage declines by approximately 8 to 10 percent per month. Good quality forage with a 14 % Crude Protein ration is sufficient to maintain the animal at this time.

Feeding the Dry Cow

The dry period is a critical phase of the lactation cycle. Proper management of the cow at this phase can increase milk yield during the following lactation and minimise any problems associated with calving.

The dry period is a non-milking phase of the cow. Good quality grass should be offered ad lib to the cow together with concentrate feed (*Table 6*).

Concentrate feed should not be given in excess of one percent of the cow's body weight. For example, a 400 kg cow should be fed 4 kg of grain (dry matter) per day to maintain its proper functioning.

The body condition of the cow must be observed daily to avoid excessive feeding which would result in an overweight animal.

A mineral lick/block should be provided with all the necessary vitamins and minerals to improve calf survival and reduce potential calving and milk fever problems.

In the last two weeks of the dry period, the nutritional requirements of the cow must be increased at a steady rate. This will allow the cow to be better prepared for calving and subsequent lactation.

Table 6: Feeding the Dry Cow

Time Period	Dairy Ration/day	Forage (ad lib)	General Remarks
First six weeks of Dry Period	14 % Pellet/Mash	Offer good quality grass	Concentrate feed should not exceed 1% of cow's body weight. A mineral lick must be provided throughout the dry period to maintain calf health.
Last 2 weeks of Dry Period	Start adding 18 % Pellet to the diet gradually	Offer good quality grass	Extra nutrients are necessary to prepare the cow for calving and lactation

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*Published and printed by
the **Extension Training and Information Services Division***

*Technical content reviewed by
the **Animal Production and Health Division**
Ministry of Agriculture, Land and Fisheries*

Trinidad and Tobago

May 2016