A NUTRITIONAL PROGRAM FOR HIGH HERDS

by

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Introduction

In recent years, dry cow and early lactation feeding have received added attention due to their importance on peak production and maximum milk yields.

Proper feeding is essential to successful dairying since feed costs account for about half the total costs of milk production and can be much greater. Therefore, for a profitable dairy enterprise, it is essential to have cows with a high genetic potential for milk production. At the same time, the cows must be fed in a way that the greatest output can be attained at the most economical cost. A shortage of energy, protein, fiber, minerals, vitamins, and water leads to stress and decreased milk production.

Superb management is extremely important if dairies are to attain rolling herd averages varying from 14,000 to 20,000 lbs of milk or even a six or more gallon average with the lactating cows. The feeding program may be quite simple so long as the overall ration contains excellent balance. Careful attention must be given to details such as how to feed, when to feed, availability of water, shade, stress related problems, traffic patterns and disease preventive programs. A program must be developed that is easy to handle and one that can be monitored on a day to day basis.

Late Dry Period

Research and accumulated results have demonstrated that a dry period of 45-60 days is needed to attain the greatest milk yield. This allows the mammary gland time to involute and prepare for the subsequent lactation. Maximum dry matter intake and milk production can be obtained if cows are fed during the dry period so that they are in good body condition without becoming fat.

Non-lactating or dry cows should be properly managed during the dry period to assure top production in the subsequent lactations. The greater her production the more likely that her body has been depleted of the nutrients used in milk secretion and the longer the dry period required to replenish the losses and to store adequate reserves for the next lactation. Cows having had any mastitis during the lactating period should be treated and carefully examined at frequent intervals during the dry period.

The condition of the cow must be taken into consideration as the lactating cow enters the non-lactating group. It has been demonstrated in recent years that lactating cows utilize energy (61.6%) more efficiently for body gain than do dry cows (48.3%). This being true means that it would be more profitable to allow the lactating cow to gain back most or all body weight losses during the latter stages of lactation rather than wait until the dry period.

During the dry period the dairy cow should be maintained in good condition. Thinner cows will need to gain some in extra flesh. Every attempt, however, should be made to maintain the dry cow in good flesh rather than fatten her. Dairy cows allowed to fatten in excess during the dry period have more problems than dairy cows freshening in good condition. Metabolic conditions and problems associated with nutritional inadequacies during the dry period are milk fever, udder edema, ketosis, and displaced abomasum. All may be controlled by proper feeding management.

The nutrient needs of dry cows are shown in Table 1.

Table 1. Nutrient Requirements During the Dry Period (Last 2 Months of Gestation) NRC 1978

Body Wt.	Crude Protein	TDN	Ca	Phos
	(lb)	(lb)	(lb)	(lb)
800	1.45	8.40	.053	.038
1000	1.69	9.93	.064	.045
1200	1.92	11.38	.075	.053
1400	2.13	12.78	.085	.060
1600	2.34	14.12	.095	.067

Most discussions of dry cow management tend to ignore fiber (roughage) since most operations have adequate silage and/or hay. In Floirda, the need may become great since silage is rare in most operations and hay may be limiting or expensive. Even so, every attempt should be made to provide some long hay to heavy springing dry cows. Avoid feeding a lot of legume hay since legumes are high in calcium and an imbalance of calcium and phosphorus may occur leading to more milk fever. Also, limit silage to 30-40 lbs per day with an increase in long fiber. Large amounts of silage, especially corn silage, tends to overcondition cows because of the high energy content. Heavy springing dry cows should receive rations that are very similar to the lactating cow in order to reduce stress brought about by changes in the feeding program at calving.

Early Lactation

The demands for nutrients by the mammary gland in early lacation are extremely great for high producing cows. Generally peak production occurs within 4-8 weeks after calving with nutrient needs increasing several fold. Peak feed intake however does not usually occur until a few weeks after peak production. During the time that feed intake lags behind milk production, nutrient intake may not be adequate to meet the needs of the mammary

gland for milk production even though the cow is being fed according to recommended guidelines or in many cases free choice. The cow is simply unable to consume enough feed or dry matter to supply the energy needed for maximum milk production even though the protein may be adequate. When the requirements become greater than the intake, some loss in body weight occurs.

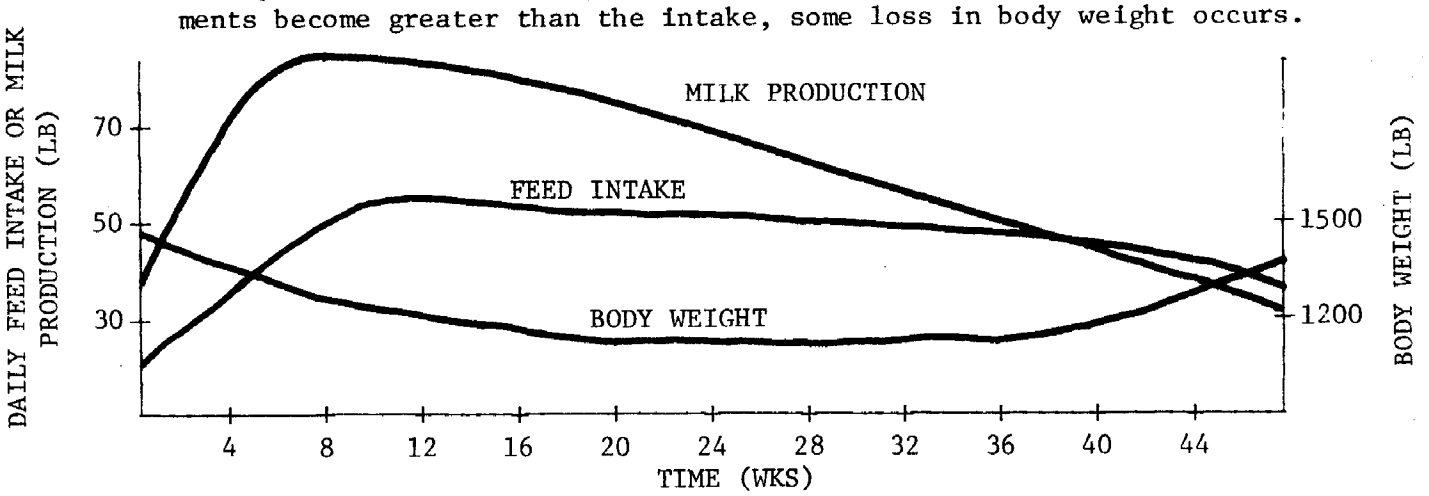

FIGURE 1. CHANGES IN MILK PRODUCTION, FEED INTAKE AND BODY WEIGHT DURING A LACTATION.

It is normal for high producing cows to lose from 100-150 lbs body weight in early lactation. The greater the cow's appetite the less body weight she will lose. If the cow has to rely too heavily upon body stores of energy and protein, either milk production will be held to the level of nutrient availability or she may develop a metabolic disorder such as ketosis. It has been demonstrated that for each pound lost from body reserves, eight pounds of milk may result.

Most weight lost in early lactation is in the form of fat with a small proportion in the form of stored protein. Fortunately, the ability of the cow to store and mobilize large quantities of energy for milk synthesis is highly developed in the high producing cow. The storage of protein, however, is less developed but some may be mobilized from tissue protein. Even so, the first limiting nutrient of high producing cows is energy, for the intake of all other nutrients can be increased in proportion to the available energy. Table 3 shows the need for nutrients of dairy cows for several different levels of milk production at two different sizes.

Table 3. Combined Requirements for Maintenance and Milk Production at Various Levels for Cows at Two Sizes and Producing 3.6% Milk Fat. (NRC 1978)

Milk (lb)	Body Wt. (lb)	CP (lb)	TDN (lb)	NE (Mcal)	Ca (lb)	Phos (lb)
30	1000	3.38	16.90	17.46	.116	.084
	1400	3.61	19.09	19.72	.126	.093
50	1000	5.04	23.08	23.86	.168	.120
	1400	5.27	25.27	26.12	.178	.129
70	1000	6.70	29.26	30.26	.220	.157
	1400	6.93	31.45	32.52	.230	.165
80	1000	7.53	32.35	33.46	.246	.174
	1400	7.76	34.54	35.72	.256	.183

Peak milk yield has been shown to be as important as average persistency in determining total milk yield for the lactation. It has been demonstrated that for each pound increase in peak milk production there is a 200 pound increase in total milk yield for the lactation.

Peak milk yield and maximum milk yield depend upon the formulation of a balanced ration and the manner in which it is presented to the cows. It must be high in energy, adequate in protein and fiber and with good balance in minerals and vitamins, especially vitamin A. The droppings from the cows should be observed daily for the right texture and stool. Acidosis and a depressed fat test may be controlled with careful observations of the droppings. Generally, complete feeds with cottonseed hulls (without other roughage) should contain about 18-19% effective fiber. Consistency in ration texture and palatability is important in keeping cows on full feed during the critical period of early lactation.

Dry matter intake for high producing cows varies and in some cows with an exceptional good appetite may peak as high as 7-8 lbs dry matter per 100 lb body weight. In general though, high producing cows will consume from 4.0-5.0 lbs of dry matter per 100 lbs body weight when receiving complete feeds containing cottonseed hulls or similar type roughages. Less dry matter intake will be obtained by cows receiving silage base rations. A number of studies have shown that high producing cows will consume an average of 3-4 lbs of dry matter when on corn silage base rations and 3.8-4.2 lbs dry matter per 100 lbs body weight when on CSH complete feeds during the first 100 days of lactation.

Ration Energy Density

The proportion of concentrates used in Florida dairy ration usually varies from 60-70%. Some dairymen use a lesser amount of roughage in the complete feed but will add some hay or silage on the outside. Care must be taken in defining the roughage portion of a ration since some researches report corn silage as all roughage when in reality it contains 50% corn dry matter and 50% stalk and leaves.

Dairy cows consume feed to meet their energy requirements. Our studies have shown that cows tend to consume the same amount of energy each day regardless of the energy density of the ration. During the hot summer, using rations that varied from 63 to 70% TDN did not influence energy intake or milk production. Some of the rations contained roughages with high effective fiber values and others contained added fat. In all cases, the added fat did not affect dry matter intake. Similar results have been obtained by Palmquist at Ohio State.

Using The Protein Solubility Concept

In recent years attention has been focused on the use of protein solubility values in formulating rations for high producing cows. Estimates of protein degradation in the rumen of high producing cows are at best only crude estimates because most ruminal protein degradation determinations have been made in sheep. Extrapolation of such estimates

from sheep to high producing cows may be erronous since differences do exist in retention time in the rumen, feed consumption, and length of chewing time. Even so, several studies have shown an advantage in milk production when low protein solubility rations were compared to high solubility rations.

Apparently, cows producing less than 40 lbs of milk may not greatly benefit from low solubility protein rations. The reason appears to be due to the fact that microbial protein provides sufficient quantities of amino acids in the lower gut.

Utilizing protein solubility values on a routine basis for formulating dairy rations requires some knowledge and understanding of the degradation values for feed ingredients. These values will no doubt vary since ingredients are processed under varying temperatures and conditions each day. The values given in Table 4 could be used as a guide where this sort of information is desirable.

Table 4. Protein Solubility and Degradation in The Rumen of Selected Feeds

Ingredients	Crude Protein (%)	Protein Solubility (%)	Calculated Degradation (%)
Urea	281.0	100	100
Corn Silage (30% DM)	2.5	54	77
Peanut meal	50.0	40	70
Wheat midds	16.0	39	70
Citrus pulp	6.2	26	63
Hay, grass	8.0	18	62
Hominy feed	10.5	23	62
Soybean meal	44.0	13	56
Cottonseed meal	41.0	7	53
Cottonseed hulls	4.0	8	50
Corn	8.6	12	56
Soy millfeed	11.0	20	65
Brewers grains	26.0	3	51

Attempts should be made to formulate rations for high producing cows varying from 15-25% soluble protein so long as the economics can be justified. Avoid using several ingredients with high solubility values in combination such as urea, peanut meal, wheat midds, and corn silage. Such combinations would benefit from having limited amounts of brewers or cottonseed meal included in the ration.

Adding Buffers and Enzymes

Reported successes with feed additives in recent years have prompted a number of researchers to further investigate their usefulness under different herd management conditions. Also, as production level increases, dairymen tend to feed higher concentrate rations and less roughage. Several additives have been shown to be helpful under stress conditions such as rapid changes in ration composition, hot weather and high humidity, disease, and stress of freshening. Buffers as feed additives are reported to be useful in counteracting acidity in the rumen produced when animals are on high grain diets or under stress conditions.

Sodium bicarbonate and magnesium oxide are the two buffers more frequently used to aid in maintaining normal milk composition and are sometimes used in combination. Sodium bicarbonate helps in the maintenance of rumen pH as well as preventing acidosis and magnesium oxide increases the uptake of plasma acetate in the mammary.

In recent months, sodium bicarbonate has been used successfully in increasing milk production in early lactation. Studies at Kentucky and Penn State both showed responses in milk production in early lactation. Results of the Penn State studies are shown in Table 5.

Table 5. Average Feed Intake and Milk Yield and First 8 Week Postpartum

Item	Ration		
	Control	Control-Buffer	Buffer-Buffer
No. of Cows	15.00	15.00	15.00
Dry Matter Intake, lb	40.04	44.88	42.02
% of B.W.	2.93	3.25	3.05
Milk Yield, lb	63.80	70.18	70.62
Fat, %	3.91	3.96	3.92

Muller et al. Penn State University, NC 119

The authors state that cows receiving rations with buffers appeared to adapt to the rations more rapidly postpartum than controls.

A survey of several top dairies and nutritionist by Marshall McCullough of Georgia in the fall of 1980 indicated that several dairies throughout the country are using enzyme preparations derived from Aspergillus oryzae as additives to dairy cattle rations. In a feedlot trial by McCullough, treated animals had daily gains of 2.77 lb/day compared to 2.31 lb/day for the control group.

Two experiments were conducted at the University of Florida Dairy Research Unit to compare the value Aspergillus Oryzae (GX) for sugarcane forage and as a complement in dairy rations. The results are shown in Tables 6 and 7.

Table 6. The Value of an Aspergillus Oryzae Product (GX) With Sugarcane Silage and Compared to Other Roughage Sources

	Feed Intake (Dry Matter)	Milk Yield	3.5% FCM	Fat Percent
Sugarcane Silage (C)	46.7	54.5	54.9	3.59
Sugarcane Silage (T)	47.1	55.3	57.0	3.71
Corn Silage	46.1	55.9	56.0	3.53
PCSH	56.7	59.5	56.4	3.21

The results in Table 6 show an advantage with the use of GX treated sugarcane forage over the control sugarcane silage of 2.1 lbs more 3.5% FCM per day during the 56 days study. Also, feed intake and fat percent were slightly greater for the cows receiving the GX treated sugarcane silage. Surprisingly, the cows receiving the GX treated sugarcane silage out performed cows receiving corn silage rations and complete feed containing PCSH; whereas cows receiving control sugarcane silage had the poorest production performance.

In a second experiment, 32 Holstein cows were used. The design of the experiment allowed for two levels of Vita Ferm (none and two ounces) to be superimposed as a continuous treatment over all other treatments. Vita Charge was fed for the first two weeks and Vita Ferm to the same cows thereafter. Vita Ferm cows were hand-fed one ounce in AM and one ounce mixed in the PM ration. Three consecutive 28-day periods were conducted. The results are shown in Table 7.

Table 7. The Value of an Aspergillus Orgzae Product (Vita Ferm) as a Complement in Complete Feeds for Dairy Cattle

Treatment	Feed Intake (DM) (lb)	Milk Yield (lb)	3.5% FCM	Percent
Control	50.9	54.1	53.8	3.50
Added Vita Ferm	52.7	58.0	56.1	3.30

The results in Table 7 show an increase of 2.3 lbs more milk with the feeding of Vita Ferm which was significant ($P<.05$). Feed intake was greater on the Vita Ferm fed cows and fat percent lower.

Management Intensity

Superb management is essential if cows are to peak high and maintain consistency in lactation. A dry cow feeding program must be developed that will allow cows to freshen in good condition with keen appetites. Cosnsitency in the feeding program must be maintained. A high energy program with adequate roughage and protein is important for high producing cows.

Group feeding must be considered where the facilities will allow for top management. The highest producing cows should be fresh from 1-3 months and will have the most aggressive appetites. The cows should have an empty trough for 1-2 hours each day. This increases the appetites of the cows, makes them more aggressive, and keeps the trough from accumulating stale feed. Provide fresh water as near the feed bunk as practical.

Ideally, the dairy should have a fresh cow group (3-4 wks), high group, medium group, and low group. Cows may be grouped according to stage of lactation or according to production. Avoid moving cows as much as possible during the lactation.

Monitor the cows daily for heat, feed consumption, stress, disease, droppings, alertness, and others as observed.

A Feeding Program for High Producing Cows

Milk (lb)	Complete Feed (CSH)*	Composition
70	50	12.5-14% CP 62-64% TDN
80	55	SAME

*3-5 lb hay/cow or equivalent

Milk (lb)	Feeding Program (lb)	Composition (CP)	(TDN)
70	40# Corn Silage	2.5%	20%
	3-5# Hay	6.0%	40%
	31# Grain	18-20%	72%
80	40# Corn Silage 3-5# Hay 36# Grain	SAME	

Milk (lb)	Feeding Program (lb)	Composition (CP)	(TDN)
70	70 Pasture	2.1%	11.0
	8 Hay	6.0%	40.0
	30 Grain	16.17%	68.0
80	70 Pasture 8 Hay 35 Grain	SAME	