

# Feeding and Managing the Transition Dairy Cow

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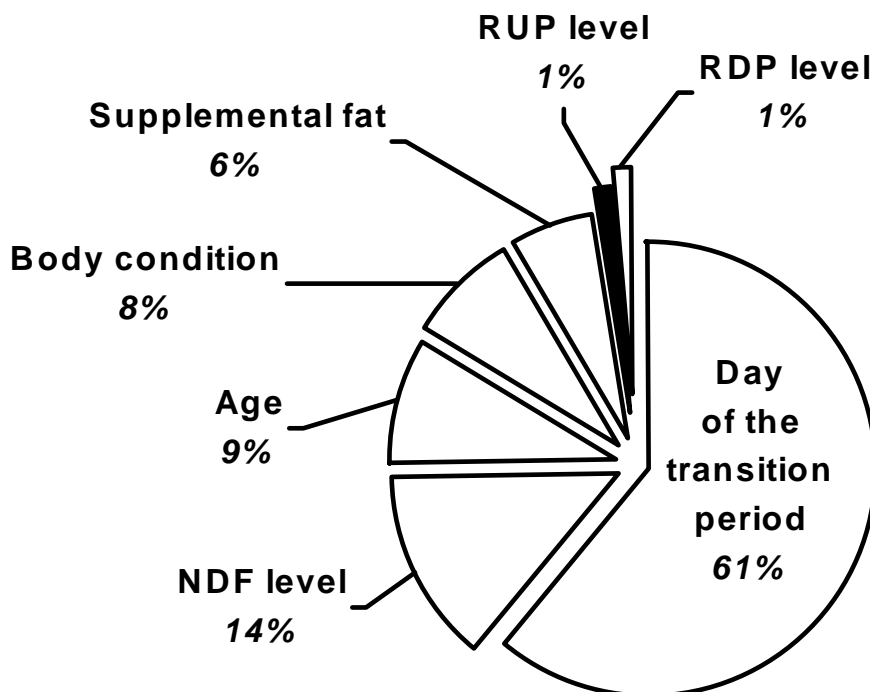
**Success in dairying** includes managing all phases of production. Research and practice have shown that for maximum return, lactation management starts during the cows' dry period. Profitable dairy operations achieve a balance between high production, good health, and successful reproduction. Good performance in all three areas is necessary for high economic returns.

During the lactation cycle there is essentially one opportunity to establish the lactation and ensure good health and reproduction: the **transition period**. The transition period refers to the time between 60 days prior to and 60 days after calving; the most critical time within this period is the 21 days before and after calving.

Correct feeding and management during the transition period has a profound effect on dry matter intake (**DMI**). DMI is a major factor influencing both milk yield and body weight change in early lactation. Higher DMI earlier in lactation reduces the time that cows are in negative energy balance. Minimizing the duration and extent of a negative energy balance also has a positive impact on reproduction.

The key goals necessary for profitability are to have cows in the right body condition for each stage of lactation and to minimize weight and body condition changes throughout lactation. Maximizing feed intake at all stages, but particularly during the transition period, will optimize production and reproduction. Attention to detail in feeding and management also minimizes metabolic disorders.

## Will she eat?



Whether a cow will eat in the transition period is largely up to her biological makeup. But, of the management factors that producers can measure, the categories shown at left have the most influence.

*RUP – rumen undegradable protein  
RDP – rumen degradable protein  
NDF – neutral detergent fiber*

**The following are key phases of the transition period and a checklist of facts affecting cow production, health, and reproduction.**

## Drying Off Cows

- Add body weight to cows during late lactation, prior to the dry period. Feed energy converts to body reserves with a greater efficiency (70 to 75 percent) than during the dry period (only 55 percent).
- Cows should be in good condition at dry off. The ideal body condition score is 3.5 to 3.75 on a scale of 1 (very thin) to 5 (very fat).
- For *slightly thin* cows (BCS 3.0 to 3.5), allow for a 60-day dry period; 45 days is adequate for cows in *good* condition (BCS 3.5 to 4.0). Cows with less than 45 or more than 60 days of dry period have been shown to consistently have lower milk production during the following lactation.

## Managing Dry Cows

- Adequate exercise is essential for maintaining cow muscle tone as well as reducing the possibility of displaced abomasum (DA). Non-exercised cows have a higher incidence of calving-related problems, mastitis, and leg problems.
- Strive to feed dry cows separately. They do not compete well for feed bunk space, limiting their intake at this critical stage and increasing their risk of metabolic disorders.
- Maintain body condition throughout the dry period until calving. Avoid fat (BCS 4.25 or greater) dry cows; they are more susceptible to fatty liver and ketosis and consume less feed (energy) upon freshening.
- Limit weight gain for thin-conditioned dry cows to 1.0 pound per day. Feed thin dry cows 5 to 10 pounds of a 14 percent protein grain mix (equal to 0.75 percent of body weight) and a grass hay low in calcium. However, be sure to provide adequate calcium, phosphorus, vitamin E and selenium.

## Feeding Far-Off Dry Cows

- Expect far-off dry cows to consume 1.8 to 2 percent of their body weight as dry matter (DM) (about 25 to 28 pounds for a 1,400 pound cow).
- Feed a long-stemmed grass hay containing 11 to 12 percent crude protein with low calcium (less than 0.7 percent) and potassium (less than 1.5 percent) levels.
- Corn silage alone is not an ideal forage for far-off dry cows because the energy content is too high. If corn silage must be fed, restrict the quantity to 10 to 15 pounds of wet (about 4.5 to 5.5 pounds DM) corn silage (35 percent DM) per head per day. Feeding excess concentrates and/or corn silage to dry cows may predispose them to displaced abomasum and fat cow syndrome.
- Legume haylage alone is not an ideal forage for far-off dry cows. If haylage must be fed, limit to 5 to 10 pounds (45 percent DM) haylage per cow per day (about 3 to 5 pounds DM).
- The far-off dry cow ration on a 100 percent DM basis: [Assumptions: 1,500 pound Holstein cow, age 57 months, 240 days pregnant, BCS 3.3, gaining 1.5 pounds per day, 31.7 pounds daily DMI – Dairy NRC, 7th ed., 2001]:

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### Nutrient Required

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NE lactation	14.0 Mcals per day
metabolizable protein (MP)	6%
rumen degradable protein (RDP)	7.7%
rumen undegradable protein (RUP)	2.2%
acid detergent fiber (ADF)	33%
neutral detergent fiber (NDF)	21%
non-fiber carbohydrate (NFC)	42%
calcium (Ca)	0.44%
phosphorus (P)	0.22 %
chloride (Cl)	0.13 %
magnesium (Mg)	0.11%
potassium (P)	0.51%
sodium (Na)	0.10%
sulphur (S)	0.20%
vitamin A	80.3 KIU per day
vitamin D	21.9 KIU per day
vitamin E	1168 IU per day

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*If dry matter intake is lower, ration composition must be adjusted upward accordingly. Feeding dry cows separately is paramount to monitor their variable intake.*

## Feeding Close-Up Dry Cows

- Expect dry matter intake to decline 5 percent per week two to three weeks prior to calving and by a total of 30 percent the last three to five days prior to calving. If typical DMI is 26.5 pounds per day, expect a reduction of 1.3 pounds dry matter daily. One week prior to calving intake may be reduced by approximately 8 pounds per day per cow.
- Select forages and feeds to provide a total of 0.045 pounds (or 100 grams) calcium or less (less than 0.7 percent calcium in ration dry matter) and provide 45 to 50 grams phosphorus per day (less than 0.35 percent in total ration dry matter). Keep the calcium:phosphorus ratio at 2:1 or lower. This typically requires limiting alfalfa which has been associated with milk fever and calcium levels that are too high.
- Adjust close-up dry cows to the forthcoming lactation ration by introducing corn silage and/or haylage to the diet. However, it is not recommended that the entire lactation total mixed ration (TMR) be fed to close-up dry cows, but rather feed a “special” close-up dry cow TMR to these cows to ensure a constant forage: concentrate ratio during the time that DMI fluctuates substantially.
- Expose close-up dry cows to all grains and concentrates being fed to the lactating herd. This is necessary to prepare the cow’s rumen wall and its bacterial population for the forthcoming high-grain ration. **Avoid mineral supplements, especially sodium bicarbonate.**
- Grain may be fed up to 0.5 percent of body weight for cows in good condition (7.0 to 7.5 pounds per cow per day) and up to 0.75 percent of body weight for cows below the optimum body condition. Be careful to limit these concentrates to 50 percent of the close-up dry cow ration dry matter or a maximum of approximately 11 pounds per cow per day.
- Feed anionic salts with rations high in calcium (greater than 0.8 percent dry matter) and/or high potassium (greater than 1.2 percent dry matter per cow per day). Increase calcium intake to 150 to 180 grams per cow per day (1.5 to 1.9 percent calcium in the ration, depending on intake) when anionic salts are fed.

- Dry cows should not lose weight during the dry period, particularly during the last 10 to 14 days prior to calving. Cows that lose weight at this stage deposit excessive amounts of fat in the liver predisposing them to fatty liver syndrome.
- The close-up dry cow ration on a 100 percent DM basis. [Assumptions: 1,670 pound Holstein cow, age 58 months, 279 days pregnant, BCS 3.3, gaining 1.5 pounds per day, 22.2 pounds daily DMI – Dairy NRC, 7th ed., 2001]:

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### Nutrient Required

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NE lactation	14.5 Mcal per day
metabolizable protein (MP)	8.0%
rumen degradable protein (RDP)	9.6%
rumen undegradable protein (RUP)	2.8%
acid detergent fiber (ADF)	33%
neutral detergent fiber (NDF)	32%
non-fiber carbohydrate (NFC)	42%
calcium (Ca)	0.48%
phosphorus (P)	0.26%
magnesium (Mg)	0.16%
chloride (Cl)	0.2%
potassium (K)	0.52%
sodium (Na)	0.1%
sulphur (S)	0.2%
vitamin A	83.3 KIU per day
vitamin D	22.7 IU per day
vitamin E	1211 IU per day

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*If dry matter intake is lower, ration composition must be adjusted accordingly.*

## At Calving

- Body condition is important. Cows that are too thin (less than 3.0 BCS) at calving lack milk yield persistency and have inadequate energy reserves for efficient reproduction. Over-conditioned cows, on the other hand, are prone to the metabolic disorders of ketosis, displaced abomasum, dystocia, retained placenta, uterine infections, and cystic ovaries.
- Subclinical milk fever (low blood calcium or hypocalcemia) and grass tetany (low blood magnesium) also depress rumen contractions, increasing the cow’s susceptibility to displaced abomasum, depressed uterine contractions increasing the risk of dystocia and retained placenta, delayed uterine involution with abnormal discharge for seven to 10 days, and increased days open. In all cases, depressed appetite leads to lower production, higher weight loss, and poor reproduction.

## Feeding Fresh Cows

- Ration formulation priorities are very important and include: meeting the minimum fiber and protein requirements, maximizing energy availability, and balancing carbohydrate and protein fractions for dry matter intake.
- Strive for peak feed intake as soon as possible. Carefully monitor feed consumption when feed and/or ingredient changes are made. Avoid or mask unpalatable feed ingredients that depress fresh cow dry matter intake.
- Feed only high quality forage to fresh cows, ensuring adequate fiber levels and effective length. The minimum forage level, in most cases, should be no less than 40 percent of total DMI. It is preferable to feed 50 percent of the diet dry matter as forage to fresh cows.
- Limit ration moisture to 50 percent when wet fermented feeds are fed to fresh cows.
- Repeatedly push up feed to cows several times a day. This activity stimulates appetite and encourages maximizing DMI.
- It is preferred that some feed be left over when cows are finished eating. Feed fresh cows an adequate amount of the diet to ensure a 5 to 10 percent refusal (or excess) to avoid “bare-bunk disease” (cows going hungry). Always have fresh, palatable feed in front of these cows, especially during cold weather.
- Make sure cows always have free access to fresh, clean water. Reports suggest that warm water can markedly improve water intake in fresh cows.
- Feeding a “fresh cow” TMR with the correct forage:concentrate ratio will help keep cows on feed, providing adequate fiber for a healthy rumen.
- To encourage an early peak to DMI, put cows on the full feed, high-group TMR as soon as possible following calving. In addition, add 4.5 to 5.5 pounds of long-stem, high-quality hay to the TMR for two to four weeks postpartum to ensure enough fiber to promote DMI.

- The fresh cow ration on a 100 percent DM basis [Assumptions: 1,500 pound Holstein cow, age 58 months, BCS 3.3, milk fat 3.5 percent, milk true protein 3.0 percent, lactose 4.8 percent, thermoneutral environmental conditions Dairy NRC, 7th ed., 2001]:

Milk Production	Nutrient Required	
	55 lbs	77 lbs
dry matter intake, lbs.	29.7	34.3
daily weight change, lbs.	2.0	3.5
days to lose one condition score	99	55
Energy – NE <sub>L</sub> , Mcal per day	27.9	34.8
Energy – NE <sub>L</sub> , Mcal per pound	0.94	1.01
metabolizable protein (MP), %	12.2	13.8
rumen degradable protein (RDP), %	10.5	10.5
rumen undegradable protein (RUP), %	7.0	9.0
neutral detergent fiber (NDF), %	25-33	25-33
acid detergent fiber (ADF), %	17-21	17-21
non-fiber carbohydrate (NFC), max. %	36-44	36-44
calcium (Ca), %	0.74	0.79
phosphorus (P), %	0.38	0.42
magnesium (Mg), %	0.27	0.29
chloride (Cl), %	0.36	0.40
potassium (K), %	1.19	1.24
sodium (Na), %	0.34	0.34
sulphur (S), %	0.2	0.2
cobalt (Co), mg/kg	0.11	0.11
copper (Cu), mg/kg	16	16
iodine (I), mg/kg	0.88	0.77
iron (Fe), mg/kg	19	22
manganese (Mn), mg/kg	21	21
selenium (Se), mg/kg	0.3	0.3
zinc (Zn), mg/kg	65	73
vitamin A, KIU per day	75,000	75,000
vitamin D, KIU per day	21,000	21,000
vitamin E, KIU per day	545	545

*If dry matter intake is lower, ration composition must be adjusted accordingly.*

## Hand-Fed Fresh Cows

- If individually fed cows eat all the grain offered, then increase the amount fed by 1 pound per cow per day. If cow intake plateaus on grain, don't continue to increase until she consistently cleans up the grain. Correctly operating computer feeders can offer an easy way to monitor daily grain intake.
- For maximum intake of high grain levels, feed grain and/or concentrates at least three or four times per day. Do not feed more than 4 to 5.5 pounds per cow per feeding to reduce the risk of acidosis and off-feed problems.



## Managing Fresh Cows

- Closely watch fresh cows for signs of digestive problems. These include:
  - large quantities of corn or grain clearly visible in the manure
  - manure very watery, gray to dark black in color
  - low or fluctuating fuel intake
  - herd milkfat test below 3.5 percent (Holstein breed) or protein-fat inversions
  - delayed peak in milk production or a lack of milk yield persistency
  - sore feet, lame cows, and laminitis (caused by acidosis)
  - cows not chewing their cud (fewer than 30 percent of cows ruminating at any one time) when not eating
  - intake or off-feed problems with possible ketosis (clinical and subclinical) and displaced abomasum
- When faced with problems related to feeding, consider changing your feeding strategy. Examples of management changes include: feeding sequence, feeding frequency, complementary grain type, extent of grain processing, and use of feed additives.
- Monitor DMI, milk production, and cow health and reproduction for improvements. Stay with practices that enhance these key performance criteria.
- Ensure adequate bunk space. Recommendations range from 18 to 30 inches per cow. The best indicator of adequate bunk space is that all cows can eat at the same time.
- “Cow comfort” is essential for good productivity, especially for fresh cows. This includes adequately sized and easily accessible stalls, and a clean, dry environment.
- Consistent, high DMI in fresh cows is a major factor influencing both milk yield and body weight change in early lactation. This reduces the time that cows are in a negative energy balance and losing weight.
- Cows naturally lose weight for the first 70 days of lactation. Aim to minimize that weight loss by feeding a balanced ration based on good quality feed and strive to maximize DMI. Cows should **not** lose more than one BCS (equivalent to 120 to 135 pound body weight) in early lactation.

## Helping Fresh Cows

- Add supplemental fat within accepted limits. Its benefit is probably more effective at decreasing body weight loss than increasing production in fresh cows.
- When supplemental fat is fed, limit it to 0.05 pounds for close-up dry cows and 0.25 pounds for fresh cows. Good feed sources of fat are roasted soybeans, sunflower seed, whole cottonseed, or tallow. An additional 0.25 pounds of protected fat may be fed after 35 days in milk to meet energy requirements.
- Use of dietary buffers may also benefit early lactation cows, especially cows that are off feed or experiencing low DMI being fed wet, high corn silage-based rations or high levels of rapidly fermentable grains.
- Sodium bicarbonate and sodium sesquicarbonate are the most common buffers used. The feeding rate is 0.05 to 0.12 pounds per cow per day or 0.8 percent of total DMI (0.75 percent of a 90 percent dry matter ration).
- Magnesium oxide is an alkalizing agent which raises the pH and reduces acidity in the rumen. The feeding rate is 0.02 to 0.07 pounds per cow per day or 0.55 percent of total DMI (0.5 percent of a 90 percent dry matter ration).
- Sodium bicarbonate and magnesium oxide are often combined in a ratio of 2 to 3:1 for greater efficacy. Use the same rates as if each were fed on its own.
- Feeding 6 to 12 grams of niacin per cow per day helps prevent ketosis and promotes dry matter intake. Feed niacin to close-up dry cows and over-conditioned, ketosis-prone cows. Feed niacin until maximum DMI has been achieved — usually within 10 weeks after calving. **Do not feed niacin to thin cows — assumed to be cows below a 2.0 BCS.**
- Yeast culture additives stimulate fiber digesting bacteria, help maintain rumen pH, and promote volatile fatty acid production, thus helping keep cows on feed. Suggested feeding rates vary quite widely at 10 to 115 grams per cow per day depending on their concentration.
- Fresh cows are more prone to rumen acidosis, the consequence of which is often lameness (laminitis). Zinc is useful in promoting hoof strength, integrity, and health. Several zinc-based products are available to feed to cows, such as zinc methionine (Zinpro™ 100 fed at 2 to 4 grams per cow per day).

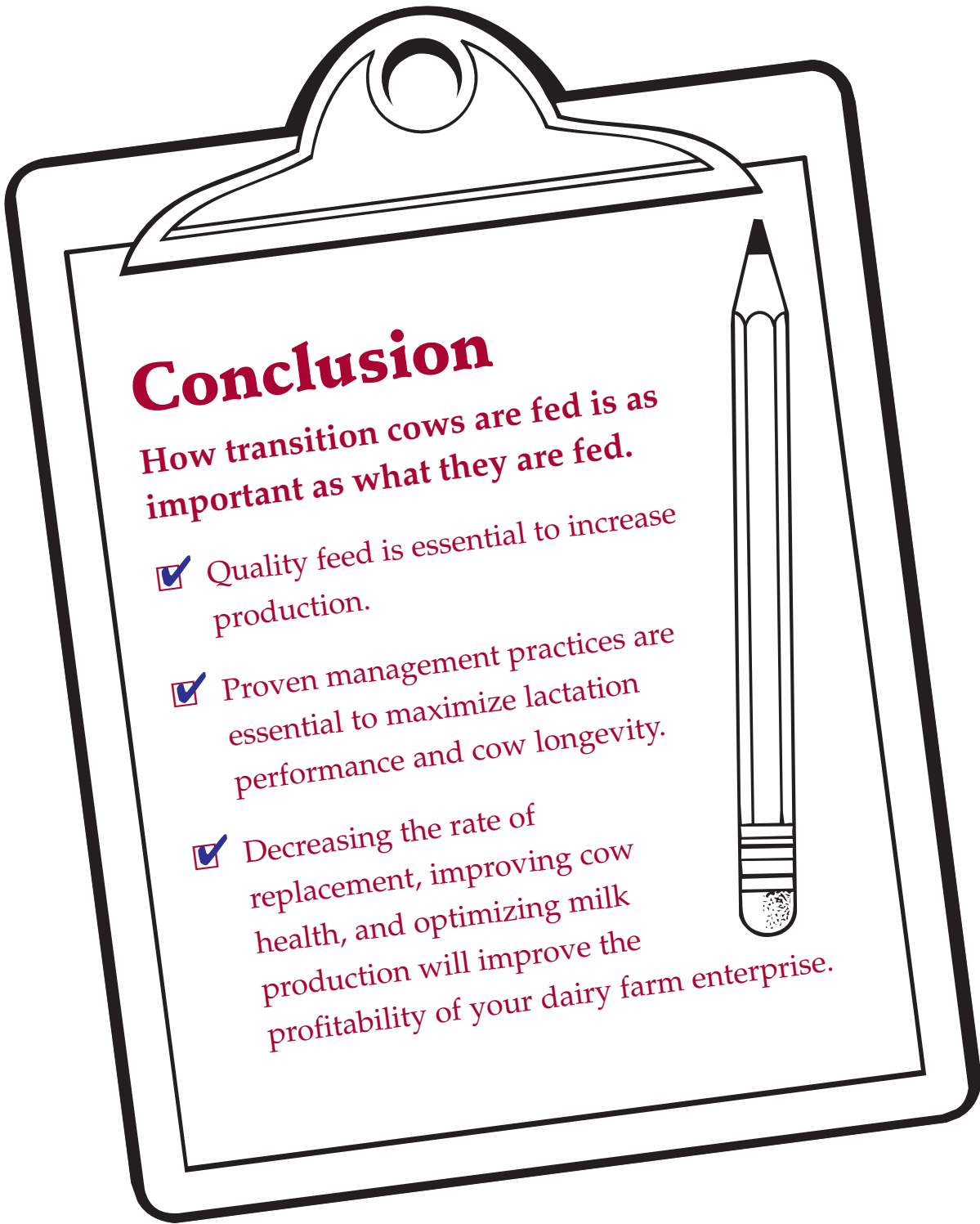
## Body condition score scale for dairy cows

Score	Condition
1.0	Skin and bones. Health problems likely.
2 to 2.5	Severe negative energy balance in diet during early lactation. A problem exists or may be developing.
2.5 to 2.75	Typical of a high producer in early lactation.
3.0	Milking cow in good nutrient balance.
3.25 to 4.25	Late lactation and dry cow in good condition.
4.5	Over conditioned; an inefficient milk producer; a cow with an extremely long lactation if milking and a potential calving problem if dry.
5.0	Severely over conditioned; a candidate for fat cow syndrome.

## Target body condition scores for stages of lactation

Recommended Score	Nutritional Objective	Warning Signs
<b>Cows at Calving</b> 3.75 to 4.25	Allow cow to calve with adequate, but not excessive, body-fat reserves.	<ul style="list-style-type: none"> <li>■ <b>Scores below 3.75</b> indicate cows received inadequate energy during late lactation and/or dry period. Failure to replenish energy reserves will limit milk production during the upcoming lactation.</li> <li>■ <b>Scores above 4.25</b> indicate that energy intake was too high during late lactation and/or the dry period. Separate dry cows from the milking herd and feed them a low-energy ration with adequate, but not excessive, protein, minerals, and vitamins.</li> </ul>
<b>Early Lactation</b> 3.0 to 3.5	Maximize intake of a high-energy ration to minimize changes in body condition and counteract negative energy balance. Ration must contain adequate protein to support peak milk production.	<ul style="list-style-type: none"> <li>■ <b>Scores below 3.0</b> <ul style="list-style-type: none"> <li>a. Very high producers may drop to 2.75 and not become a problem.</li> <li>b. Thin cows that are not high producers are not getting enough energy. Be sure that all nutrients are balanced properly and that dry matter and water intake are adequate.</li> </ul> </li> <li>■ <b>Cows have good body condition (3.5 to 3.75)</b>, but production is not as high as expected. Check for inadequate intake of protein, mineral or water.</li> </ul>
<b>Mid-Lactation</b> 3.5	Maintain body condition at this score to maximize milk production.	<ul style="list-style-type: none"> <li>■ <b>Scores below 3.5</b> indicate that cows are receiving inadequate energy. Check early lactation ration, because problem began with that ration.</li> <li>■ <b>Scores above 3.75</b> require reducing energy intake to avoid over conditioning.</li> </ul>
<b>Late Lactation</b> 3.75 <i>Aim for 3.75 to 4.25 at time of dryoff</i>	Replenish energy and fat reserves to prepare cow for next lactation. Avoid over conditioning.	<ul style="list-style-type: none"> <li>■ <b>Scores below 3.75 at dryoff</b> mean cows are receiving inadequate energy. Check to see that early- and mid-lactation cows are receiving enough energy, since problem may have begun there.</li> <li>■ <b>Scores above 4.25 at dryoff</b>, reduce energy intake during late lactation.</li> </ul>
<b>Dry</b> 3.75 to 4.25	Maintain body condition in recommended range. Feed low-energy ration that provides adequate, but not excessive, amounts of protein, vitamins and minerals.	<ul style="list-style-type: none"> <li>■ <b>Scores below 3.75</b> <ul style="list-style-type: none"> <li>a. Increase energy intake. Inadequate body fat reserves can decrease milk production in upcoming lactation.</li> <li>b. Increase energy content of late-lactation ration. Body fat reserves should be replaced at that time.</li> </ul> </li> <li>■ <b>Scores above 4.25</b> <ul style="list-style-type: none"> <li>a. Reduce energy intake while maintaining adequate levels of protein, vitamins and minerals.</li> <li>b. Reduce energy intake of late-lactation cows, because the problem may have begun there.</li> </ul> </li> </ul>
<b>Heifers</b> 3.25 to 3.75	Maintain body condition in recommended range. Feed a balanced ration that provides adequate, but not excessive, amounts of energy, protein, vitamins and minerals.	<ul style="list-style-type: none"> <li>■ <b>Scores below 3.25</b> may indicate a nutritional problem. If heifers are allowed to become too thin, they will not grow at the proper rate and may have reproductive problems later on.</li> <li>■ <b>Scores above 3.75</b> have been shown to be associated with a far greater infiltration in the mammary glands of heifers at puberty. When these heifers freshen, they will not produce to their full genetic potential.</li> </ul>

*Adapted from Perkins et al., Body Condition Scoring, New York Dairy Management Fact Sheet, 1985.*



## **Conclusion**

**How transition cows are fed is as important as what they are fed.**

- Quality feed is essential to increase production.**
- Proven management practices are essential to maximize lactation performance and cow longevity.**
- Decreasing the rate of replacement, improving cow health, and optimizing milk production will improve the profitability of your dairy farm enterprise.**

**For more information on this and other topics, see: [www.ag.ndsu.edu](http://www.ag.ndsu.edu)**

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