

Nutritional Strategies of the Future

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■ Take Home Message

- ▶ Future dairy nutritional areas will include nutrient management as it relates to nitrogen and phosphorus, role of biofuel production and by-products, and forage quality.
- ▶ The importance of transition cow nutrition, cow comfort, and water quality was less important in 2006 compared to 2001.
- ▶ Key focus areas selected by the author included feed consistency, nitrogen and phosphorus excretion, rumen digestion, transition diets, and feed testing for model predictions

The next ten years will bring new opportunities and old challenges to the dairy industry. A recent survey reported at the 2006 American Dairy Science Association Annual Meeting in Minneapolis, MN, may be of interest to dairy managers, veterinarians, educators, consultants, and industry representatives. The results can provide a “crystal ball look” into the future that applies to and can impact these occupational groups.

For dairy managers: What challenges will they need to address and solve?

For dairy veterinarians: What treatments and needs will they need to handle?

For dairy researchers: What research will be needed to answer concerns?

For dairy consultants: What questions will you need to answer for your clientele?

Dairy educators: What topic should be taught and level of training offered?

Dairy research funding agencies: What areas need to be funded to maintain our competitive edge?

■ The Survey

In May of 2006, a survey was sent out electronically to a selected group of dairy specialists (Monsanto Dairy Advisers) asking each person to list five feeding and nutritional topics that will be important in the next ten years. From their list of five feeding topics, each person was asked to select their number one (most important) challenge or opportunity facing the U.S. dairy industry. A total of 54 responses were received out of approximately 190 individuals receiving the survey instrument. A breakdown of groups included 27 veterinarians, 17 consultants, 16 educators, 7 industry representatives, two dairy producers, and two other support industry representatives (DHI and forage testing lab). The total number of occupations is greater than 54 as several individuals have multiple responsibilities. The map indicates where the responding dairy experts were located. Table 1 summarizes the most important or number one challenge that each person selected. The number indicates the frequency of that response based on my interpretation and grouping of responses.

Table 1. Number one priority by each dairy respondent and frequency of the response.

Forage quality	16
Nitrogen and phosphorus excretion	10
Ethanol, starch, and distillers grain impact	6
Ration formulation	4
Fiber digestion	4
Impact of milk prices and feed costs	3
Feed efficiency	2
Reducing feed variation and content	2
Body condition score and reproduction	1
Freedom to operate	1
Cow immunity and health	1
Optimizing milk components	1
Feed additive use and economics	1
Rumen acidosis control	1

The results indicate new topics are emerging such as environmental impact of nitrogen and phosphorus and distillers grain/starch relationship as ethanol production explodes. Forage quality continued to be “the number 1” factor to focus on in the future. Transition cow feeding and ration formulation continue to be solid first choices and will be important in the next ten years.

■ Looking at Key Areas

The results of the survey were grouped into broad categories for the five areas listed by each individual in Table 2. The total number of individual responses was 247 (does not total 270 as some individuals only listed two or three areas).

Table 2. Summary of the five priorities by each respondent and its frequency.

Nutrients (total number is 68)	
Excretion of nitrogen and phosphorus	32
Starch, ethanol, and distillers grains aspects	17
By-product feed consistency	6
Strategic use of additives	4
Metabolizable protein and amino acid applications	3
Mineral availability and calcium dynamics	4
Role of polyunsaturated fatty acids (PUFA)	2
Forages considerations (total number was 48)	
Forage quality	25
Corn silage hybrids and quality	8
Fiber digestibility in forages	5
Strategic feeding of high forage rations	4
Forage test application and accuracy	4
Grazing systems	2
Feeding bunk management and systems (total number was 44)	
Feed bunk variation	10
Feed consistency	9
Feed availability and inventory control	9
Cow-person-ship (mixing the ration and delivery)	9
Rumen health related to feed bunk management	4
Cow behavior related to the feeding system	2
Facility design to enhance feed intake	1
Economics of feeding (total number was 38)	
Economics of feeding and feed cost impact	13
Ration balancing	8
Maintaining and enhancing milk components	6
Feed efficiency (dry matter and protein)	6
Managing and minimizing feed shrink	3
Organic recommendations and applications	2

Cow health (total number was 28)	
Transition diets and grouping of dry cows	15
Rumen health related to the transition period	4
Health and longevity related to feeding programs	4
Heat stress impact	3
Hemorrhagic bowel syndrome	1
Biosecurity to minimize disease exposure	1
General areas (total number was 21 votes)	
Calf and heifer feeding programs	6
Reproduction and feeding relationships	5
Restricted use of GMO* feeds and additives	5
Water quality and supply	4
Need for applied research support	1
Impact of nutraceuticals in milk production	1
Animal identification	1
Role of energy costs on dairy farms	1

*GMO = genetically modified

The list in Table 2 is broad and varied with interesting individual comments offered that were difficult to capture and report. Environmental concern over excretion of protein and phosphorus is a key concern and needs to be addressed and solved as consumers and governmental regulations will impact dairy farms. With expansion of ethanol plants, the impact of large amounts of inexpensive distillers grains (both dry and wet) and the diversion of ten percent of corn grain to ethanol production will impact corn grain prices and starch sources in dairy rations. Forage quality gained more support. Feed bunk management continues to be important too with feed consistency, inventory control, and training of the feed delivery personnel listed as key points. Review the list and draw your own conclusions and list of priorities. Do not overlook some points with small numbers (such as training of future dairy nutritionist and veterinarians and the need for funding for applied research which will be decided by land grant university and veterinarian administrators; not dairy managers).

■ Looking Back to 2001

At the 2001 ADSA meetings, a similar survey (same survey group with small numbers of responses) was conducted. Key areas from 2001 were summarized in Table 3 for comparison to 2006.

Table 3. Responses reported in 2001 survey with the frequency of responses based on the top five areas listed by individuals.

Feed bunk management	47
Forage quality and aspects	33
Transition cow rations	21
Cow comfort aspects	19
Water quality and supply	17
Nutrients	13
Ration balancing	10

Interesting observations can be made. Water quality, feed particle size, and cow comfort issue had more focus and “votes” in 2001. Have dairy managers and specialists solved or minimized these concerns? Cow-person-ship, environmental concerns over nitrogen and phosphorus, and distillers grain/starch factors did not make the list in 2001. Forage quality, feed bunk management, and transition cow rations continue to be “big winners” or important areas of concern in both surveys.

■ Hutjens Five Focus Areas

Feed consistency is the top focus on my list.

- ▶ Feed bunk management including uniformity of the ration (finding slugs of unprocessed hay or lack of cottonseed or soybeans in areas in the bunk), lack of consistent mixing time (no idea of how long your TMR mixer runs), wide variation in feed delivery times (should be within 15 to 30 minutes every day), and wide variations between feed composition in the feed bunk compared to paper ration.
- ▶ Sorting contributes to a lack of ration consistency in feed bunk management. Learn signs of sorting, causes of sorting (too dry, too long, low quality forage, and too much feed), and approaches to reduce sorting (adding water or molasses, reducing particle size, and improving forage quality).
- ▶ Inventory control (not running out of corn silage for example) and control shrink due to errors in adding of feed, waste, wind losses, and inconsistent feed weigh backs.

Nitrogen and phosphorus excretion is number 2 on my list as environmental concerns by consumers and added feed costs for dairy managers will be important.

- ▶ Idaho is defining and measuring nitrogen losses by air emissions.

- ▶ Nutrient plans may be required dictating manure applications and acreage needed to spread manure.
- ▶ MUN (milk urea nitrogen) tests could become a benchmark to determine environmental risk, loss of on-farm nitrogen raising feed costs, and negative impact on dairy cattle reproduction.
- ▶ Wisconsin workers indicate crude protein levels below 16.5% can support high levels of milk production based on amino acid and rumen nitrogen models.
- ▶ Additional research may lower dietary phosphorus below 0.38 percent.
- ▶ As by-product feeds continue to increase in rations (especially corn distillers grain), higher levels of phosphorus and protein levels can occur.
- ▶ Nitrogen efficiency (percent nitrogen capture as milk or tissue protein) could become a benchmark for evaluating optimal feeding programs.

Rumen function and optimization is my number 3 focus area.

- ▶ Feed efficiency (pounds of 3.5% fat-corrected milk per pound of dry matter consumed) continues to be an economic indicator of successful feeding programs. Rumen function is a key factor that contributes to a value over 1.5.
- ▶ Microbial protein yield can provide over 60 percent of daily amino acid requirement and over 80 percent of energy as volatile fatty acids (VFA).
- ▶ Rumen acidosis or SARA (subacute rumen acidosis) continues to be the number one field metabolic disorder leading to lameness.
- ▶ Feed additives including buffers, ionophores, direct-fed-microbials, and yeast products continue to be economically justified based on research.

Transition feeding risks is my fourth focus area.

- ▶ Culling of cows in early lactation continues to be over 20% of cows culled (based by Georgia, Florida DHI, and Minnesota DHI data) leading to huge economic losses.
- ▶ Canadian workers report metabolic disorders can be identified several days before calving based on dry matter intake and other metabolic indicators.
- ▶ Genomics - genes “turned on or off” - indicates that changes at the cell level may be a futuristic research area (University of Illinois).
- ▶ Immunity in transition cows can impact disease response and cow health.

- ▶ Stress (pen crowding, feed bunk spacing, heat stress, mixing of pregnant heifers with older dry cows, and pen moves) has been implicated in feed behavior modification.

Building rations is my fifth area (was not a popular area in the survey).

- ▶ While models can predict rumen yield and small intestine absorption, field values based on expensive feed tests for models and variable dry matter intakes limit successful applications.
- ▶ NDFD (neutral detergent fiber digestibility) values continue to challenge dairy managers and consultants as values vary from lab to lab and numerous tests are available (12, 24, 30 and 48 hour test). Individuals have dismissed this useful test as too variable and of limited value.
- ▶ Some labs report three to five net energy for lactation values for corn silage causing confusion and leading to the question: which one is right?
- ▶ Ration software programs and models predict nutrients to the nearest gram while mixing accuracy on farms is much more imprecise and variable.
- ▶ Do we know how to feed high producing cows that peak at 73+ kg of milk when research is conducted in tie stall research units with cows producing 36 kg of milk.

■ In Summary

The power of this survey is the number of responses and broad background of the individuals that participated; we thank these individuals for taking time and thought to contribute. Each person can interpret the data differently based on their experiences and background. Finally, each individual should develop their list of top five challenges in the next decade.

■ Selected References

Hutjens, M.F. 2006. Feeding challenges our industry will face. Hoard's Dairyman Magazine. Vol 151, no 16, p. 624.

