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## **Chapter 5**

# **The Future Demand for Food Supply Veterinarians in Dairy Practice Careers**

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# Introduction

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This study provides a systematic analysis of the likely future demand and potential shortages for food supply veterinary medicine (FSVM) professionals in dairy practice careers. Five inter-related questions are addressed:

1. What are the issues and trends likely to drive the future demand for food supply veterinarians in dairy careers?
2. Assuming a continuation of currently unfolding trends and the absence of major catastrophic events, what will be the demand for dairy food supply veterinarians over the next several years?
3. What are the specialized activities (e.g., roles, responsibilities, skill areas, clients served, etc.) that will have substantially higher or lower demand relative to the general pattern of demand in the dairy practice area?
4. What are the issues and trends likely to drive the future supply of food supply veterinarians entering dairy careers?
5. Given the pattern of emerging trends and factors influencing the supply and demand and assuming the absence of major catastrophic events, what is the likely surplus or shortage of dairy food supply veterinarians over the next several years?
6. Given the answers to the first four questions, how can the FSVM profession take action now to create a better future?

This report provides a description of the research method used and then presents the answers to each of these six questions.

## The Delphi Forecasting Technique

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Food supply veterinarians live in a changing world. Predicting the future is never an easy task and the changing context of the FSVM profession makes the linear extrapolation of historical trends with econometric models, as was used in the KPMG Mega Study, more problematic. The Delphi forecasting process is an expert judgment forecasting method and is the main alternative to historical trend-based methods. It is the best method for identifying emerging trends and the likely patterns of future demand for FSVM professionals, and determining whether there will be shortages or surpluses of food supply veterinarians in the future.

The Delphi method works hand-in-hand with strategic planning processes in that it appreciates that the future is only partly a function of unfolding larger societal forces that cannot be easily managed or changed. It appreciates that the future is largely a function of trends that, if better understood now, can be acted upon before the future arrives. It is designed to identify leverage points that are important to planned change effort. Strategic action by thoughtful leaders taken now can change the pattern of future demand and shortages/surpluses that experts predict will occur if current trends continue and no catastrophic events occur.

In this study, 13 different sectors of the FSVM profession were identified and a Delphi forecasting process was used to evaluate each sector. The FSVM sectors evaluated are: Academe, Dairy, Swine, Poultry, Beef Cattle, State/Provincial Public Service, three sectors of US Federal Service (Public Health, Animal Health, and Food Safety & Security), Canadian Federal, Industrial Veterinarians in Pharmaceuticals, Small Ruminants, and Mixed Food Animal Practitioners in Rural Settings. After identifying a

sector, experts were identified who best could address the five questions noted above. In general, panels of 15-25 members for each sector were created.

The Delphi method gathers expert opinion and then provides a structured feedback process where experts have an opportunity to consider the views of other experts. The feedback process is structured so experts can change their predictions without any dysfunctional group dynamics that can plague interacting groups. It sets up a learning process where one expert has an opportunity to reconsider his or her own judgment in the face of conflicting viewpoints from other experts. This should make the Delphi panel collectively smarter at the end of the process. The Delphi process used had three stages:

1. Panel members completed a first survey that included questions related to the first five questions noted above. We included items, identified from the FSVM literature and asked panel members to rate their influence on the future supply or demand for food supply veterinarians in their sector. We also included open-ended questions giving panel members an opportunity to suggest additional relevant issues not included in the initial listing. After getting panel members to think about the trends and issues driving future demand, we then asked them to forecast demand changes over various time periods between 2004 and 2016. Panel members then rated the influence of various supply related trends. This was designed to help them think about likely future labor supply flows and prepared them to forecast whether there would be shortages or surpluses of veterinarians over these same time periods.

2. The results of the first survey were incorporated into the second survey. New items were derived from a content analysis of the open-ended replies. Demand and supply influence items where there were higher levels of disagreement within the panel were repeated, and the average rating and middle 50% range (between the 25<sup>th</sup> and 75<sup>th</sup> percentile) information was presented with each one. A brief report explaining the general patterns in the data, including explanations for disagreement within the panel on future demand and shortage/surplus forecasts, accompanied the second survey. Thus, when panel member re-estimated future demand and shortages/surpluses they did this while considering panel information from the first survey.
  
3. The third survey followed a similar design strategy. Items with higher disagreement were repeated, and the panel average and middle 50% range information were presented in this last survey. In addition, a brief report summarized the results of the second survey. Finally, items describing 18 different possible solutions to the projected shortage were added to this survey addressing the last question noted in the introduction.

Panel members came primarily from the US but experts focused on Canada were also included. Panel members identified whether they had focused on the Canadian versus the US context and additional analysis evaluated whether there seemed to be significant differences in the ratings of the US versus Canada sub-groups. While we see all panel members as having good expertise, we appreciate that some may be more expert than

others. Panel members rated their own forecasting expertise and additional analyses contrasted those better than the median “expertise” score with those on the less-expert side of the median. This analysis identified items where there was significant difference between those two sub-groups. Whenever Canada versus US and expert versus less-expert differences were found, they were noted in the feedback to the panel. With the expertise contrasts, there was a tendency for significant differences in the earlier survey to become less significant in the second or third survey.

# Issues and Trends Driving Future Demand for Dairy Veterinarians

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The panel responded to both panel-suggested demand-related items that are unique to this sector as well as items drawn from the general FSVM literature. This latter set of 25 items was included in the first surveys to all 13 panels included in this study. In addition to rating the 25 general items, panel members provided suggestions on additional issues influencing demand in the dairy FSVM sector. Seven additional items were derived from those open-ended comments for a total of 32 items. In the second survey, the 7 new items were asked and items from the original set of 25 were repeated when there was fair disagreement within the panel's ratings. Higher agreement on several items was reached in the second survey and the items with greater disagreement were repeated a final time in the third survey.

The following are the survey items seen as having the highest influence on future demand<sup>1</sup>:

## Trends Increasing Demand

1. Public concerns over food safety (5.67 on a 7-point scale)<sup>2</sup>
2. Using broad expertise as part of the production management team (mean: 5.59)  
*Note that self-rated experts (mean: 5.92) saw a significantly stronger relationship to demand increases than less-expert raters (mean: 5.13)*
3. Client use of veterinary herd management services (mean: 5.33)

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<sup>1</sup> Where significant differences exist between those focused on the Canadian context versus the US-focused sub-group mean, they are noted. Similarly, where significant differences ( $p < .10$ ) between the ratings of the self-rated forecasting experts' sub-group versus the less-expert sub-group exist, those respective means are noted.

<sup>2</sup> The items were rated on a 7-point Likert-type scale and evaluated based on the expected influence on future demand. The mean rating for each item is noted in parentheses. The following scale anchor points will help interpret those means: 4. No Influence, 5. Slight Increase, 6. Increase, 7. Strong Increase.

4. Required use of third-party certification or verification of standards (mean: 5.26)  
*Note that Canada-focused ratings (mean: 4.0) were significantly lower than ratings by US-focused panel members (mean: 5.44)*
5. Zoonotic disease-related human health concerns (mean: 5.24)
6. Availability of highly technical or specialized services (mean: 5.14)
7. Growing need to track animals entering the food chain (mean: 5.05)
8. Public concerns over bio-terrorism (mean: 5.05)
9. Need to understand animal-human health eco-systems (mean: 5.64)
10. Delivering more specialized services to large producers (mean: 5.05)
11. Increasing concern for animal wildlife (mean: 5.00)
12. Providing government or legally required services (mean: 5.00)  
*Note that self-rated experts (mean: 5.30) saw a significantly stronger relationship to demand increases than less-expert raters (mean: 4.75)*
13. Training non-DVM staff at large producers (mean: 4.86)  
*Note that self-rated experts (mean: 5.50) saw a significantly stronger relationship to demand increases than less-expert raters (mean: 4.25). Also, Canada-focused ratings (mean: 4.0) were significantly lower than ratings by US-focused panel members (mean: 5.19).*

See Exhibit B for a listing of these items as well as the distributions and ratings of all items used in the 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> wave surveys. Note that items with a mean rating of 4.0 to 5.0 (between the “4. No Influence and “5. Slight Increase” scale anchor points) are, with one exception (item 13), not presented. See the appendix for these values. The mean values noted for each of the above (and following) items are from the last survey in which that item appeared.

Items with means below 4.0 are seen as leading to decreases in demand for food supply veterinarians. The survey items rated as having a negative or decreasing influence on demand are:

### **Trends Decreasing Demand**

1. Less demand for “sick animal” services (mean: 2.62)<sup>3</sup>
2. Slow adoption of new technology by veterinarians (mean: 3.05)
3. Non-DVM producer staff doing work previously done by DVMs (mean: 3.09)
4. Move to larger sized producer operations (mean:3.09)
5. Lack of veterinarian’s practice management & business skill (mean: 3.16)
6. Use of non-DVMs, such as veterinary technicians (mean: 3.45)
7. Federal and/or State/Provincial budgetary constraints (mean: 3.52)
8. Client concerns about veterinary service cost (mean: 3.57)
9. Curtailment of government support of veterinary services (mean: 3.75)<sup>4</sup>

### **The Planning Matrix**

The ratings of these items are important to the extent that they can be used to understand and plan for the future. Some items noted above identify issues or trends that are “actionable,” or in other words, strategic actions can be developed to alter the expected pattern of influence suggested by the panel’s mean score. Others items identify issues that are fairly fixed constraints and not particularly actionable. These items

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<sup>3</sup> The items were rated on a 7-point Likert-type scale and evaluated based on their influence on future demand. The mean rating for each item is noted in parentheses. The following scale anchor points will help interpret those means: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence.

<sup>4</sup> See Exhibit B for a listing of these items as well as the distributions and ratings of all items used in the 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> wave surveys. Note that items with a mean rating of 4.0 to 5.0 (between the “4. No Influence and “5. Slight Increase” scale anchor points) are not presented. See the Exhibit B for these items. The mean values noted for each of the above (and the following) items are from the last survey in which that item appeared.

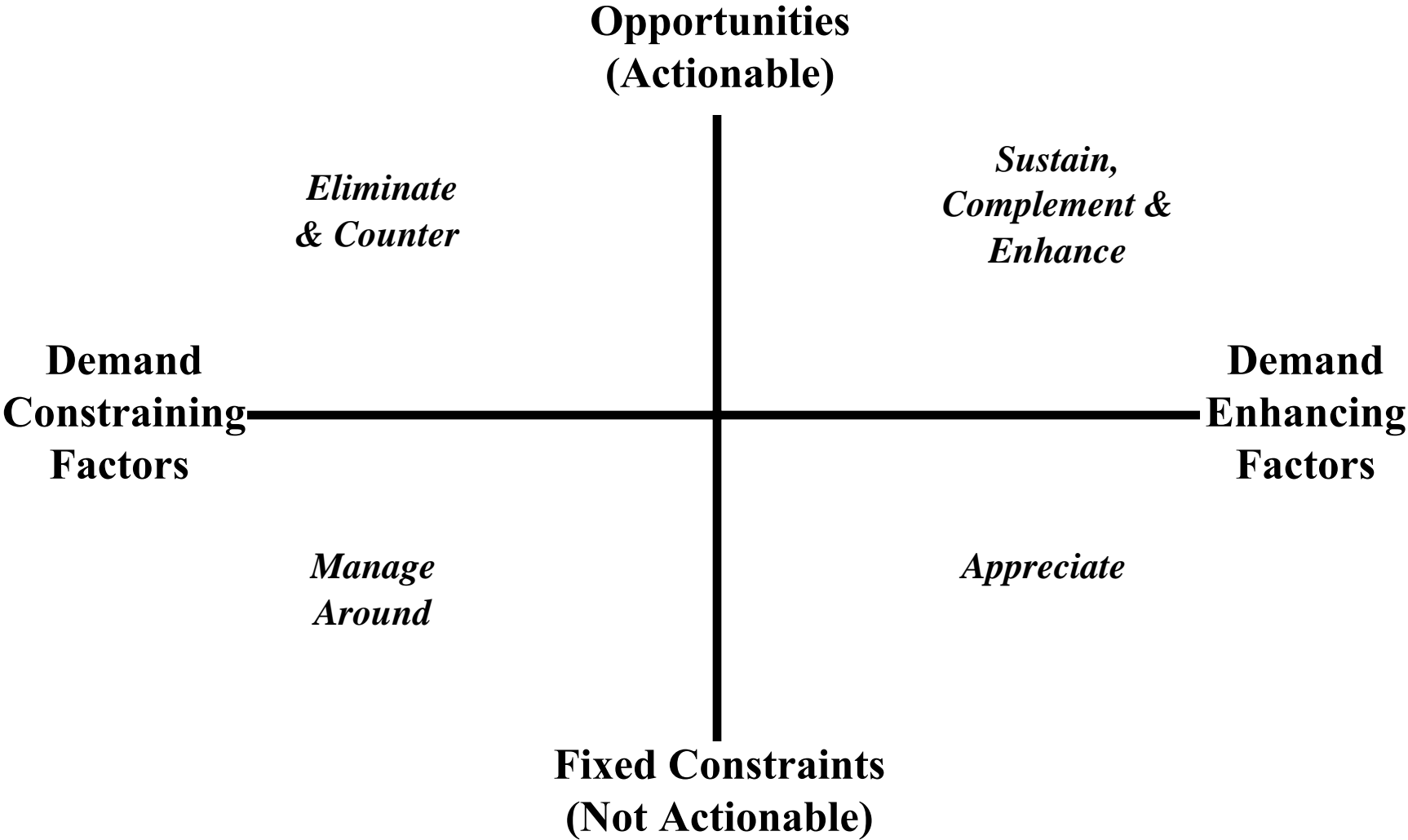
represent general societal concerns where the cooperation of other entities beyond the FSVM profession, such as governments, is needed to change the expected pattern of influence on future demand.

Figure 1 presents a planning matrix useful in organizing the results and guiding future strategic action. The best targets for strategic action are in the “actionable” or top-half of the figure. In order to increase future demand, actionable demand-constraining factors (on the left-side of the figure) must be eliminated or countered in some fashion. The top, right-side quadrant represents actionable demand-enhancing opportunities that can be sustained, complemented, or enhanced in some way. The lower quadrants are less-manageable trends and factors. Any strategic responses to the challenges uncovered by this research need to be mindful of the constraints which the profession does not have very much control over.

This planning matrix can be used to organize the results of the analysis of the demand related issues and trends. The nine demand-decreasing items noted above all logically map to the left-side of Figure 1. Figure 2 captures the pattern seen in the results noted above. For example, items 2 (slow technology adoption) and item 5 (poor practice management) are related to dairy veterinarians’ weak business skills and resistance to the use of new technologies. This is noted as the *Business Skills & Technology Resistance* theme and is placed on the upper-left quadrant of Figure 2. With educational initiatives, these demand constraints can be lessened. Others are much less actionable. For example, items 7 (government budgets) and 9 (curtailment of government support) both related to the *Governmental Budgetary Constraints* theme noted in Figure 2. While small changes may make an important contribution, changing the underlying problem (large deficits) is

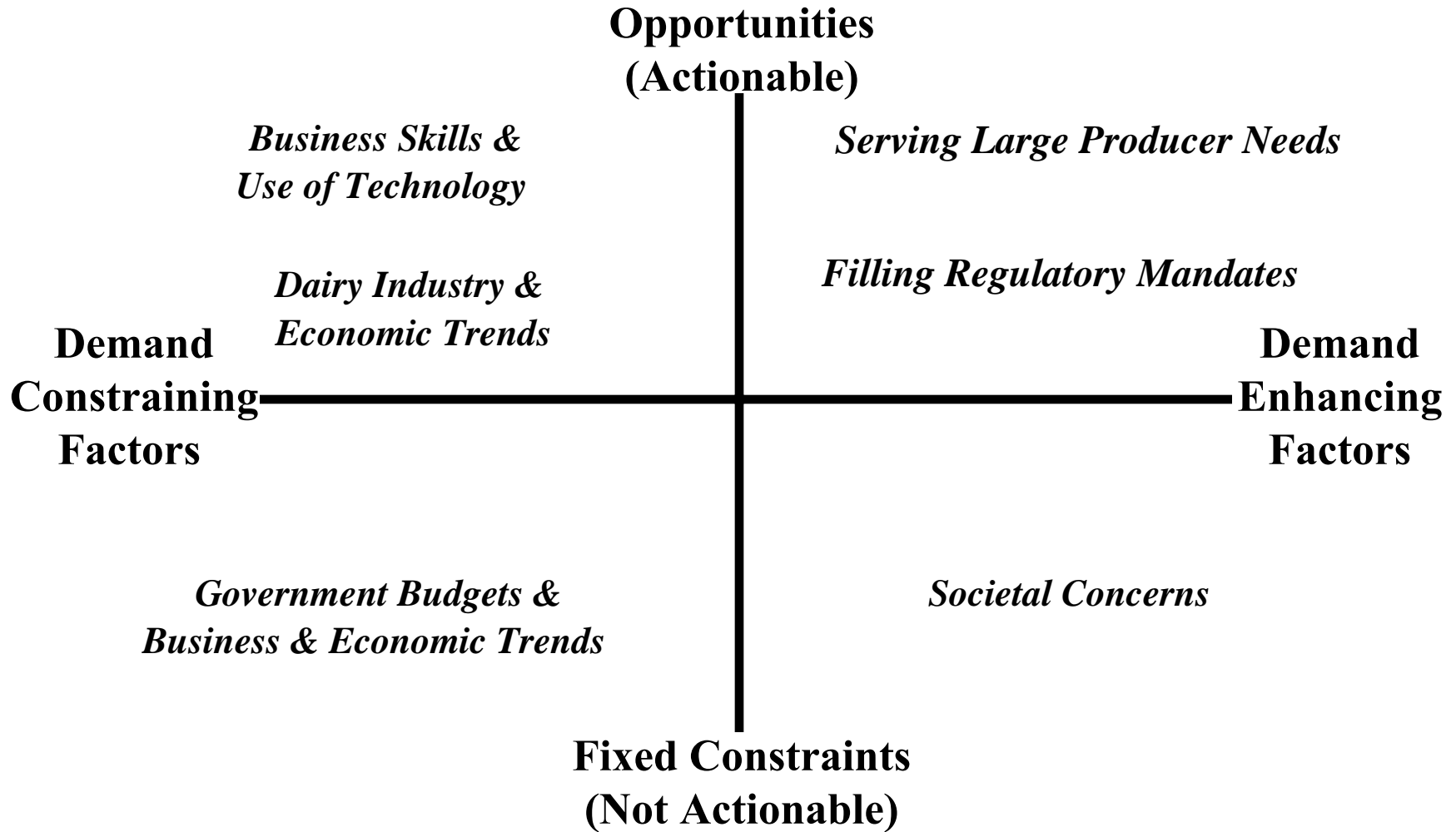
not actionable and requires the profession to adapt to and manage around these constraints. Given these fairly fixed constraints, this theme has been placed in the lower-left quadrant of Figure 2. All of the remaining items, such as item 4 (move to larger sized producer operations), item 6 (use of non-DVMs), item 3 (Non-DVMs staff doing work), item 8 (client concerns over cost), and item 1 (less demand for “sick animal” services) are a function of larger economic trends and the way that business is increasingly done in the dairy industry. The challenge for the profession is how to adapt to these constraints. For example, colleges of veterinary medicine must prepare students for this reality.

# Figure 1 Planning Matrix



# Figure 2

## Demand Diminishing & Enhancing Issues in the Dairy Sector



Continuing education initiatives may also be needed to help veterinarians adapt to the large producer operation environment. This last theme, *Dairy Industry & Economic Trends*, is placed near the middle line but in the upper-left quadrant in recognition of the mix of constraints that must be managed around but also some very real opportunities for strategic action that can be used to, in part, turn these trends into an advantage.

Many of the 13 demand-increasing items summarized above relate to larger societal concerns. These include items 1 (food safety), 5 (zoonotic disease), 8 (bio-terrorism), 9 (eco-systems), and 11 (wildlife). These *Societal Concerns* have a positive influence on demand and are largely constraints in that they cannot be directly changed by strategic actions. As such, these fall in the lower-right quadrant of the Figure 2 planning matrix. More actionable items that enhance demand are noted in the upper-right quadrant. These include item 2 (using broad expertise in the production management team), item 3 (use of herd management services), item 6 (technical or specialized services), item 10 (delivering more specialized services to large producers), and item 13 (training staff at large producers). Most of these items explicitly involve serving the needs of large dairy operations. Educational initiatives can better prepare veterinarians to deliver these services to these clients and capitalize on this trend. This is noted as the *Serving Large Producer Needs* theme and is in the upper-right, actionable quadrant of Figure 2. Strategic actions can leverage these demand-enhancing influences and deliver high value services to these large dairy operations. The remaining items are item 4 (certifications, verification of standards), item 7 (ID and tracking), and item 12 (legally required services) are somewhat in between the previous two groups of factors. This *Filling Regulatory Mandates* theme has been placed near the line but is seen as falling into

the actionable upper-right quadrant of Figure 2. While these trends have their basis in larger societal concerns and governmental actions, there is plenty of strategic maneuvering room in how the profession will encourage and respond to these emerging issues.

## The Future Demand for Dairy Veterinarians

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The Delphi process provides panel members an opportunity to make initial estimates of future demand over several time periods in the first survey. The second survey and the feedback report that summarized the general patterns seen in the first survey provided an opportunity to re-estimate future demand. The Delphi methodology encourages panelists to reconsider their estimates in light of the views of other panel members. The third survey and accompanying report on the second survey results was a second opportunity to reconsider and make final projections of future demand.

Demand estimates were grouped into three time periods: Short-Term (fall of 2004 to fall of 2007), Medium-Term (fall of 2007 to fall of 2010) and Long-Term (fall of 2010 to fall of 2016). Demand estimates were stated in the form of the expected percentage increase or decrease from the start to the end of these time periods. Both range and point estimates are provided. The range estimates identify the middle 50% of panel members (i.e., the estimates between the 25<sup>th</sup> percentile and 75<sup>th</sup> percentile of the distribution, or inter-quartile range) and the point estimates include both the arithmetic mean and the median (or the 50<sup>th</sup> percentile estimate) of the distribution of estimates. Figures 3 through 5 present the results for each time period. The pattern of estimates indicates continuing disagreement within the panel on the nature of future demand. While the means and median values are always positive and between +1% to +5% increases in demand, the middle 50% range always includes negative numbers and forecasts of decreasing demand. Figure 6 presents a summary of the forecasts from the final survey.

# Figure 3

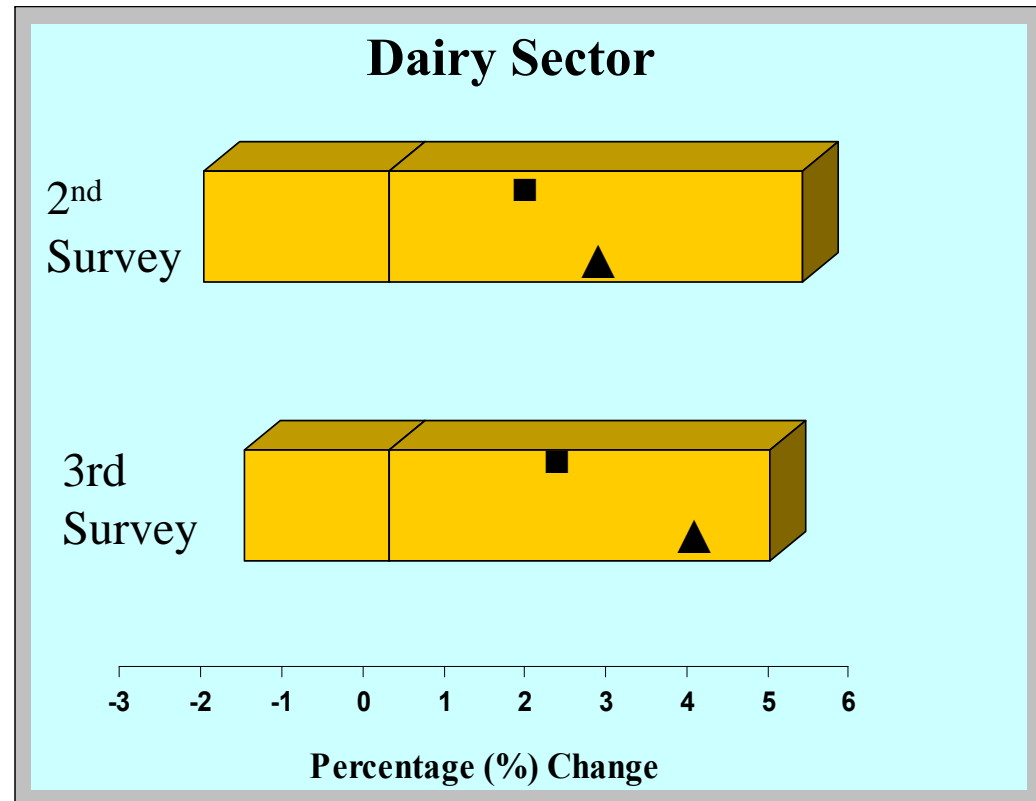
## Short-Term Demand Change (2004-07)

### 2<sup>nd</sup> Survey Results:

- Mid-50% = -2.0% to +5.5%
- Mean = +1.9% (■)
- Median = +3.0% (▲)

### 3<sup>rd</sup> Survey Results:

- Mid-50% = -1.5% to +5.0%
- Mean = +2.5% (■)
- Median = +4.0% (▲)



# Figure 4

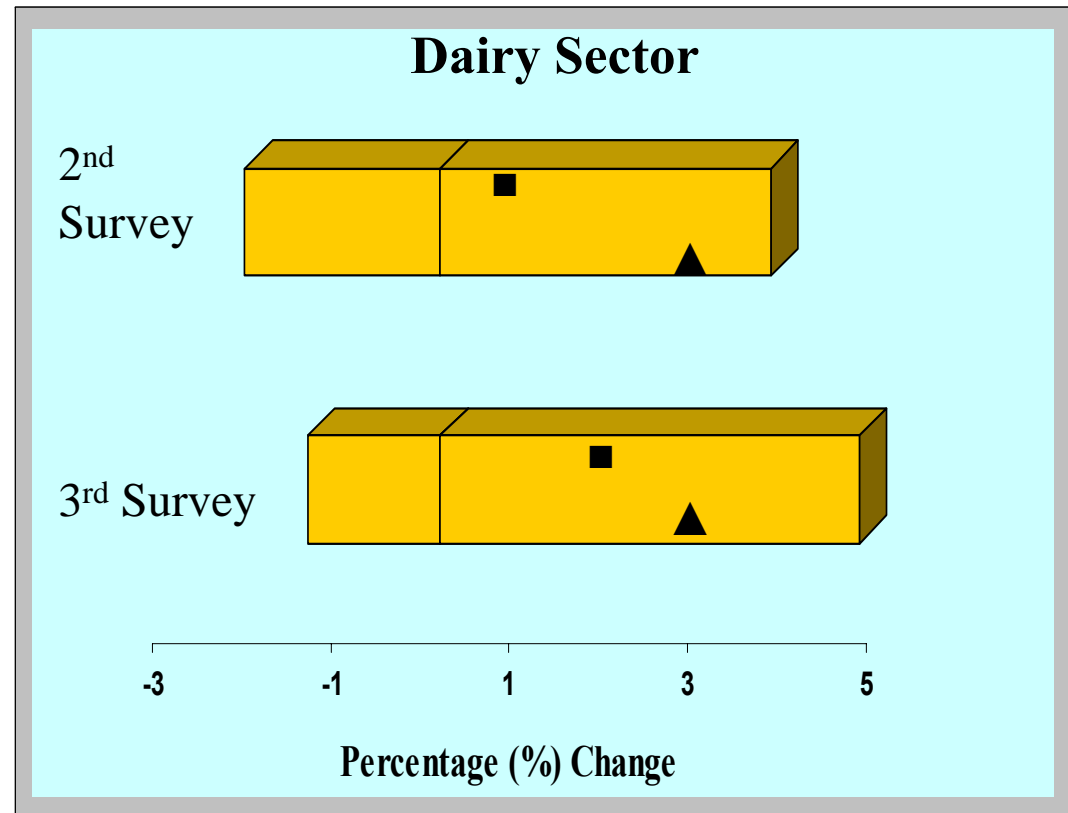
## Medium-Term Demand Change (2007-10)

### 2<sup>nd</sup> Survey Results:

- Mid-50% = -2.0% to +4.0%
- Mean = +1.0% (■)
- Median = +3.0% (▲)

### 3<sup>rd</sup> Survey Results:

- Mid-50% = -1.3% to +5.0%
- Mean = +2.1% (■)
- Median = +3.0 (▲)



# Figure 5

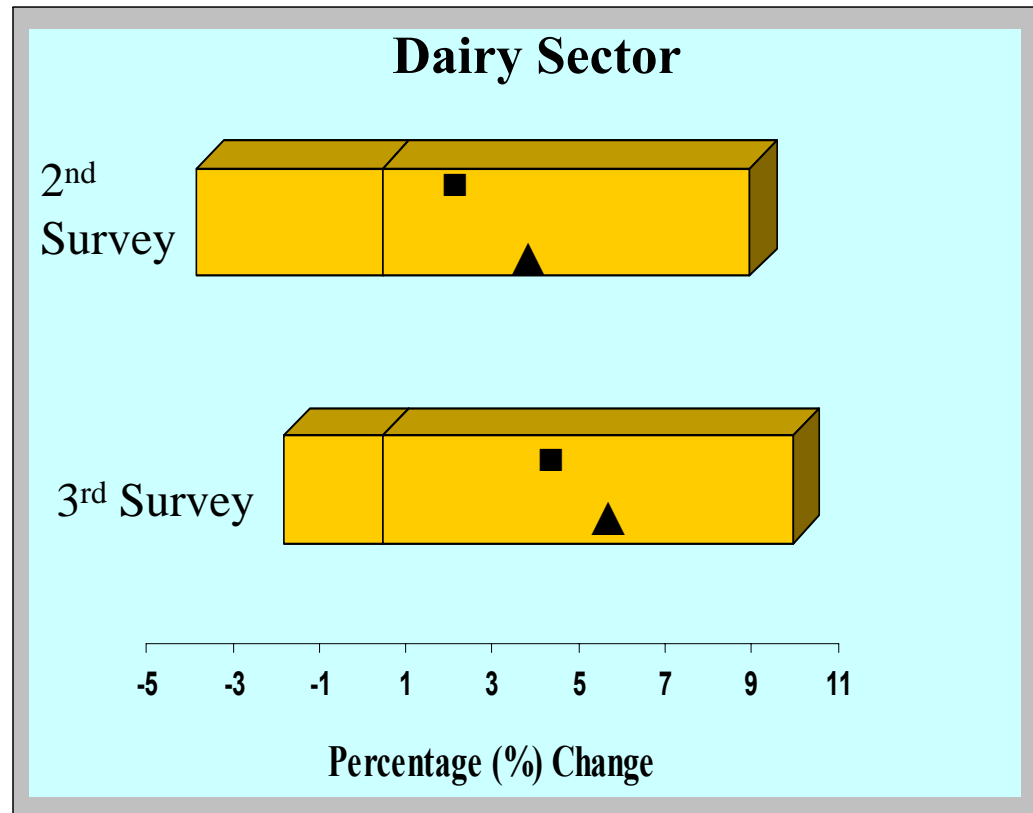
## Long-Term Demand Change (2010-16)

### 2<sup>nd</sup> Survey Results:

- Mid-50% = -4.0% to +9.0%
- Mean = +2.3% (■)
- Median = +4.0% (▲)

### 3<sup>rd</sup> Survey Results:

- Mid-50% = -2.0% to +9.8%
- Mean = +4.2% (■)
- Median = +5.5 (▲)



# Figure 6

## Future Demand Summary

### Short-Term:

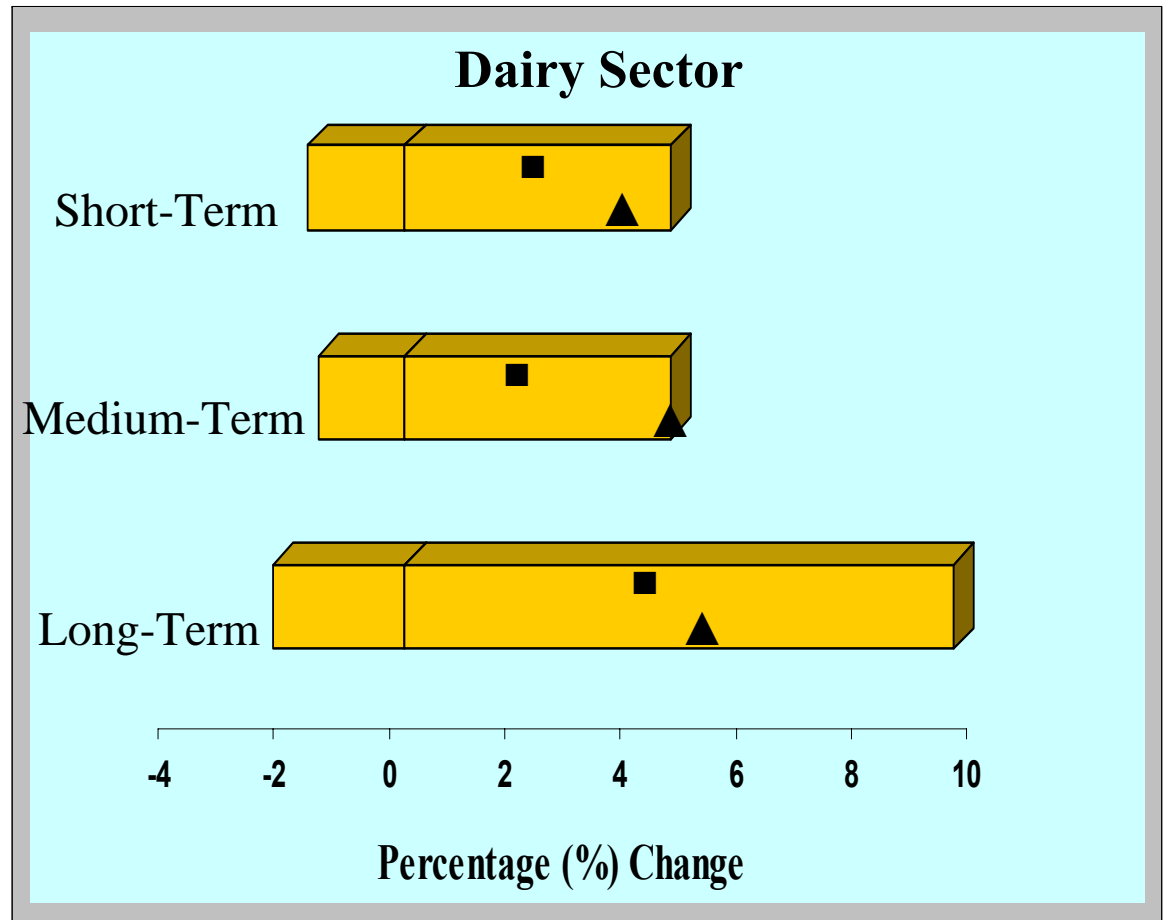
- Mid-50% = -1.5% to +5.0%
- Mean = +2.5% (■)
- Median = +4.0 (▲)

### Medium-Term:

- Mid-50% = -1.3% to +5.0%
- Mean = +2.1% (■)
- Median = +3.0 (▲)

### Long-Term:

- Mid-50% = -2.0% to +9.8%
- Mean = +4.2% (■)
- Median = +5.5 (▲)



Further analysis combined panel members' forecasts over all three periods and the results indicate that one-third of the panel sees on average decreasing demand and the other two-thirds see increasing demand. The median forecast of the “demand is decreasing” sub-group is -2.88% and the median estimate for the demand is increasing” sub-group is 5.00%. This presents strikingly different views. Further analysis was done to better understand the views of these two sub-groups.

### **Growing or Declining Demand**

To more fully understand the wide range of demand increase projections, t-test analyses were done between the perceptions of those seeing rating demand decreases versus those projecting increases in demand. Several differences are apparent from that analysis. The following demand-related factors are seen as having a significantly *stronger* demand-increasing influence in the demand-is-increasing versus demand-is-decreasing sub-group:<sup>5</sup>

- Using broad expertise as part of the production management team (mean: 5.86 on a 7-point scale in the increasing demand sub-group vs. mean: 5.00 in the decreasing demand sub-group)
- Delivering more specialized services to large producers (mean: 5.50 in the increasing demand sub-group vs. mean: 4.43 in the decreasing demand sub-group)
- Client use of veterinary herd management services (mean: 5.69 in the increasing demand sub-group vs. mean: 4.57 in the decreasing demand sub-group)

Those seeing increasing demand compared to those seeing decreasing demand also saw the following demand factors as having a *weaker* demand-decreasing influence:

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<sup>5</sup> The scale introduced earlier should be used in interpreting the mean values for the high vs. low increasing demand for these and the next set of items: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence, 5. Slight Increase, 6. Increase, 7. Strong Increase.

- Move to larger sized producer operations (3.57 in the increasing demand sub-group vs. mean: 2.29 in the decreasing demand sub-group)
- Use of non-DVMs, such as veterinary technicians (mean: 3.79 in the increasing demand sub-group vs. mean: 2.86 in the decreasing demand sub-group)

The consolidation of smaller operations into large dairies is a dominant reality in this industry. Those seeing increasing demand see opportunities in this trend. Providing specialized services, including herd management services and broad expertise as part of the production management team, leads to more demand for veterinary services. While the use of non-DVMs to deliver veterinary-related services was not a positive feature of the emerging context in with dairy veterinarians practice, it was almost a neutral factor for those more optimistic about future demand. This pattern reinforces an earlier conclusion noted in Figure 2. Serving the needs of large producers and finding ways to add unique value to those operations will lead to increasing demand. Not making that transition places dairy veterinarians in a precarious position marked by decreasing demand for services. The data suggests that both sub-groups see generally decreasing demand for traditional veterinary services. Large producer operations will continue to find substitutes and have less need for such services. The demand-is-increasing sub-group sees that specialized services for these producers will lead to demand increases that will outweigh the declining demand for traditional services.

# Specialized Activities Increasing or Decreasing in Demand

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Open-ended questions in the first survey invited panel members to identify activity areas (e.g., roles, responsibilities, skill areas, clients served, etc.) where there will be a substantial future increase or decrease in demand beyond the general pattern of demand for dairy veterinary services. These areas were content analyzed and 11 areas received multiple mentions. These were used to form items which panel members rated in the second survey. Those activity areas rated as having *higher* demand (starting with the highest areas) are:

## Trends Increasing Supply

1. Health management services (mean: 5.68 on a 7-point scale)<sup>6</sup>
2. Herd production services (mean: 5.55)
3. Training staff at large operations (mean: 5.41)
4. Milk quality consulting (mean: 5.32)  
*Note that Canada-focused ratings (mean: 6.00) were significantly higher than ratings by US-focused panel members (mean: 5.13).*
5. Nutrition consulting (mean: 5.10)
6. Diagnosis & disease control services (mean: 4.41)
7. Reproductive medicine for herds (mean: 4.09)

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<sup>6</sup> The items were rated on a 7-point Likert-type scale and evaluated based on forecasted increase in demand relative to the expected general pattern of demand. The mean rating for each item is noted in parentheses. The following scale anchor points will help interpret those means: 4. No Difference, 5. Slight Increase, 6. Increase, 7. Strong Increase. There were no significant differences in the ratings of expert versus less-expert subgroups on these activity areas ( $p < .10$ ).

## Trends Decreasing Supply

The activity areas rated as facing *lower* demand than the general pattern food supply veterinary services (starting with the lowest rated areas) are:

1. Sick animal services (mean: 2.59 on a 7-point scale)<sup>7</sup>
2. Vaccinations & dispensing prescriptions (mean: 2.86)  
*Note that Canada-focused ratings (mean: 4.67) were significantly higher than ratings by US-focused panel members (mean: 2.69).*
3. Surgery (mean: 3.14)
4. Pregnancy diagnosis (mean: 3.33)  
*Note that Canada-focused ratings (mean: 4.33) were significantly higher than ratings by US-focused panel members (mean: 3.27).*

These results shed further light on the conflicting views (increasing demand vs. decreasing demand) seen in the panel's future demand projections summarized above. Many of the activities seen as having higher demand assume a large producer context. Items 2 (herd production services), item 3 (training staff), and item 7 (herd reproductive medicine) are prime examples. Those activities seen as facing lower demand, such as item 1 (sick animal services), item 3 (surgery) and item 4 (pregnancy diagnosis) all assume a focus on the health of a single animal.

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<sup>7</sup> The mean rating for areas seen as decreasing in demand are noted in parentheses and the following scale anchor points will aid interpretation: 4. No Difference, 3. Slight Decrease, 6. Decrease, 7. Strong Decrease.

# Trends and Issues Driving the Future Supply of Dairy

## Veterinarians

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The panel responded to both panel-suggested supply related items as well as items drawn from the general FSVM literature. The latter set of 17 items was included in surveys to all 13 panels included in this study. Six additional supply-related influence items were drawn from open-ended comments in the first survey and included in the second survey. Items from the initial set of 17 items were repeated in the second survey when there was fair disagreement within the panel on the influence of an item. The final survey included items with fair disagreement seen in the second survey ratings. The mean value of the last rating of an item is used in the summary below. There were only two factors rated as *increasing* the future supply of veterinarians entering dairy practice careers:

1. Initiatives targeting recruitment and selection of FSVM-oriented students into colleges of veterinary medicine (mean: 4.95 on a 7-point scale)<sup>8</sup>
2. Salaries available in dairy practice careers (mean: 4.14)

The panel rated several trends and factors that are seen as leading to a *decrease* in the future supply of veterinarians entering dairy careers. These are the more extreme supply-decreasing factors:

1. Less emphasis on food animal practice in veterinary colleges (mean: 1.86)<sup>9</sup>

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<sup>8</sup> The items were rated on a 7-point Likert-type scale and evaluated based on their influence on future supply of veterinarians entering dairy practice careers. The mean rating for each item is noted in parentheses. The following scale anchor points will help interpret those means: 4. No Influence, 5. Slight Increase, 6. Increase, 7. Strong Increase.

<sup>9</sup> The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future supply of dairy practice veterinarians. The mean rating for each item is noted in parentheses. The following

*Note that self-rated experts (mean: 1.58) saw a significantly stronger relationship to demand decreases than less-expert raters (mean: 2.22)*

2. Little exposure to food supply career options in college (mean: 2.43)
3. Need to work long hours and emergency calls (mean: 2.57)
4. Lack of positive role models in veterinary food supply practice (mean: 2.89)
5. Lack of spousal career options in rural areas (mean: 2.91)
6. Selection of students with non-farm backgrounds into veterinary schools (mean: 2.91)
7. Physical demands of large animal veterinary work (mean: 3.00)
8. More women veterinarians entering the workforce (mean: 3.00)
9. Opportunity in other areas of veterinary medicine (mean: 3.09)
10. High debt load of veterinary school graduates (mean: 3.14)
11. Lack of cultural and recreational opportunities in rural areas (mean: 3.24)  
*Note that self-rated experts (mean: 2.91) saw a significantly stronger relationship to demand decreases than less-expert raters (mean: 3.75). Also, note that Canada-focused ratings (mean: 4.00) were significantly higher than ratings by US-focused panel members (mean: 3.20).*
12. Lack of food supply practice-related externships for students (3.24)

These supply-related factors can also be organized into the planning matrix introduced earlier. Figure 7 captures the general pattern seen in the above listings. The above list of 12 more extreme supply-constraining factors all map to the left-side of the matrix. Several items, such as items 1, 2, 6, and 12 relate to how colleges of veterinary medicine tend to select, educate and direct students. This theme is noted as *CVMs Non-FSVM Focus*. These are actionable issues. Colleges can change their policies and practices. Thus, these logically fit into the upper-left quadrant of the planning matrix.

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scale anchor points will help in the interpretation of those means: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence.

Similarly, item 4 relates to the extent that students see positive role models that attract them to the profession also fits into the same quadrant and is noted as *Poor Role Models* in Figure 7. Strategies can be pursued to better the mentoring process and present more effective role models to students and those entering dairy practice careers. Item 9 relates to larger economic opportunities that veterinarians face and this is noted as *Alternative Career Opportunities*. High student debt load (item 10) is a factor not easily addressed without financial resources from outside the profession. There are recent examples of scholarship programs and government student loan repayment initiatives that make this an actionable issue and logically maps to the upper-left quadrant of the planning matrix as well. Given the need for external resources to fully address this challenge, the *Student Debt* theme has been placed near the line in Figure 7. Item 7 (physical demands) is not readily changeable. Bovines are large and physically demanding. Similarly, the *Work Requirements* theme, noted by item 7 (physical demands) and item 3 (long hours/emergencies), are a part of the dairy veterinarian's job description. Bovines are large and physically demanding and have health needs that do not always fit into the 8-to-5 schedule. However, new practice management models and tools have lessened these problems. For this reason, this theme is also placed near the bottom of the upper-left quadrant.

A number of the items constraining the entering supply of veterinarians into dairy practice listed above reflect larger demographic and social trends and, as such are less actionable. They need to be understood and managed around. For example, items 5 (spousal career options) and 11 (cultural opportunities) reflect larger economic patterns in rural areas. This is noted as the *Rural Economic/Social Constraints* in the lower-left

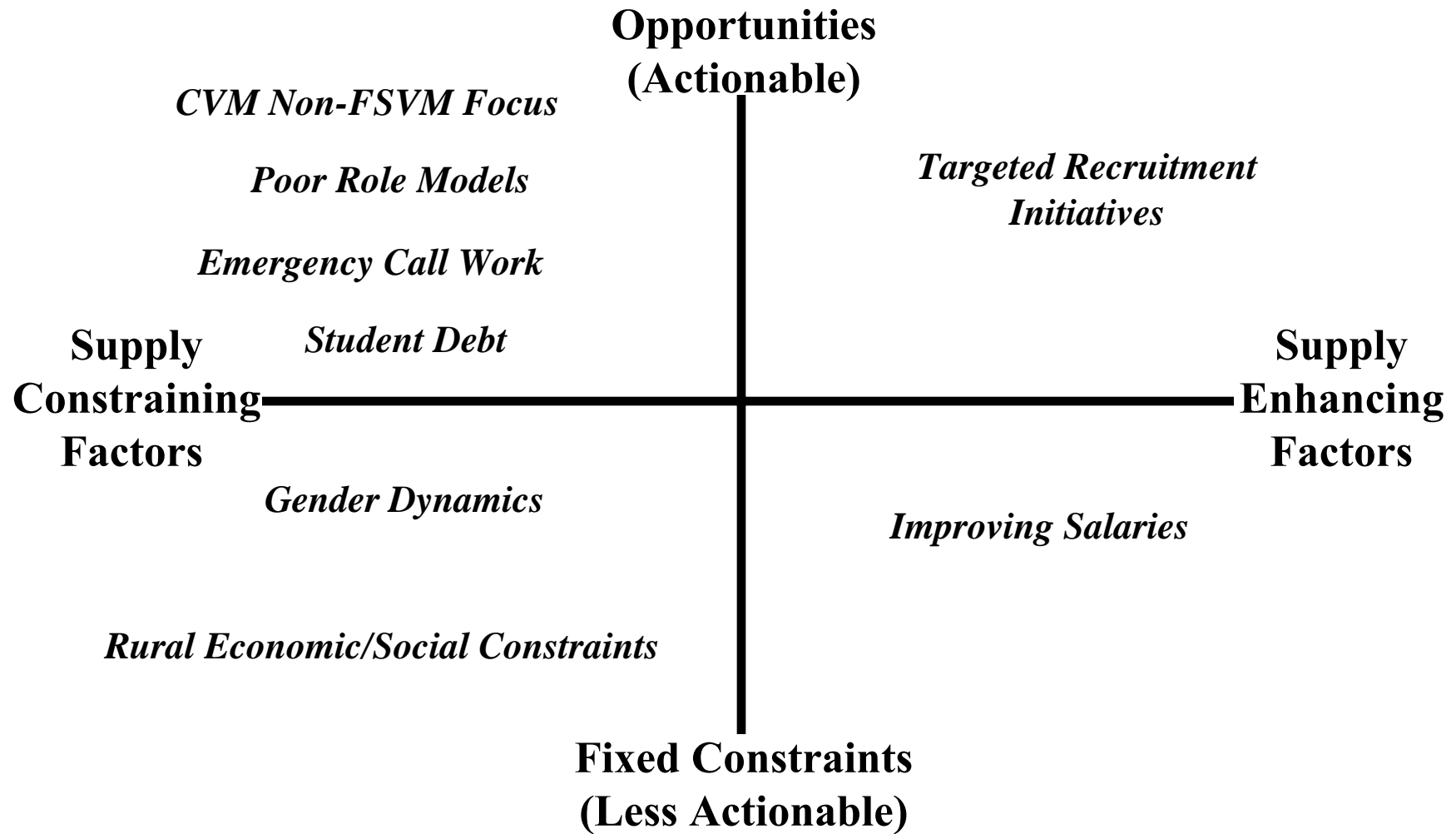
quadrant of Figure 7. Item 8 (more women veterinarians) notes the increasing number of females being attracted to veterinary careers and to professional careers in general.

This logically fits in the lower-left quadrant of Figure 7 and is noted as *Gender Dynamics* in Figure 2. While the dairy side of the profession can be made more attractive, competing opportunities will continue to emerge. The free movement of labor to opportunities is a fundamental aspect of our economic system and will not, hopefully, change. It will continue to be a constraint that must be managed around and, thus, also belongs in the lower-left quadrant.

The two supply-increasing trends and issues presented above represent opportunities for promoting the profession and building the supply of dairy veterinarians. Item 1 (targeted recruitment initiatives) is an actionable strategic initiative that can be enhanced and extended. This *Targeted Recruitment Initiatives* theme has been placed in the upper-right quadrant of Figure 7. Item 2 refers to the recognition of improving salaries available to dairy veterinarians. This is partially a result of general economic factors that are less subject to direct action and this *Improving Salaries* theme has been placed in the lower-left quadrant. Salaries, it should be noted, are also a function of the mode of organizing practices and these are strategic choices.

# Figure 7

## Supply Diminishing & Enhancing Issues in the Dairy Sector



## The Future Shortages of Dairy Veterinarians

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After rating demand and supply related factors, panel members were asked to project the “most likely” estimate of the percent that available supply veterinarians would differ from the expected demand over various time periods. The Delphi process gave panel members an opportunity to make initial estimates of future shortages or surpluses in the first survey. Second and third survey estimates provided additional opportunities to re-consider earlier estimates after seeing the collective views of other panel members. Estimates of shortages were grouped into three time periods: Short-Term (fall of 2004 to fall of 2007), Medium-Term (fall of 2007 to fall of 2010) and Long-Term (fall of 2010 to fall of 2016). Panelists were instructed to assume a continuation of current trends and an absence of any catastrophic events in making their forecasts. These estimates are stated in the form of the expected average percentage surplus or shortage for each time period. As was the case with demand estimates, both the range (i.e., the middle 50% of estimates) and the arithmetic mean and the median (i.e., the 50<sup>th</sup> percentile of the distribution of estimates) are used to summarize these forecasts. Figures 8 through 10 provide the results of each period. Figure 11 provides the summary of the results from the final survey for all three periods.

The middle 50% of the panel always forecasts a shortage of food supply veterinarians in dairy practice. This is generally in the 2% to 5% range. The point estimates of the future shortage are very consistent over the forecast period. The means and median ratings are in the 3.5% to 5.0% range. In contrast to the forecasts addressing whether demand for veterinarians is increasing or decreasing, there is solid agreement that there will be a shortage of dairy veterinarians.

# Figure 8

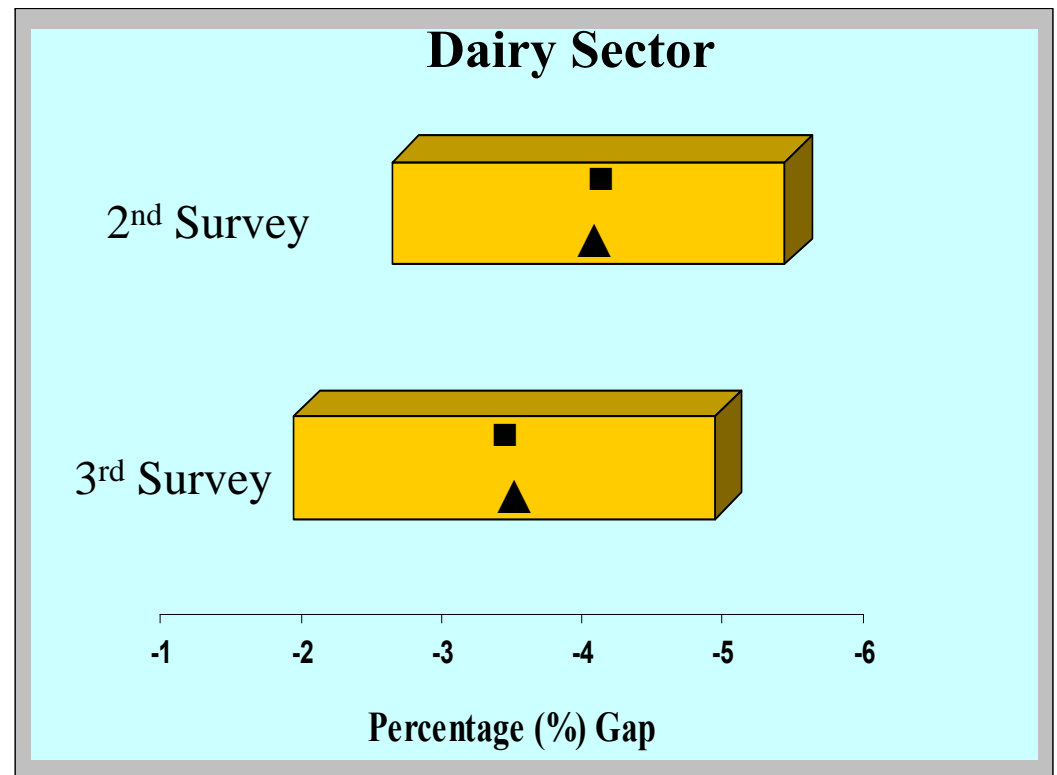
## Short-Term Shortages (2004-07)

### 2<sup>nd</sup> Survey Results:

- Mid-50% = -2.8% to -5.5%
- Mean = -4.0% (■)
- Median = -4.0% (▲)

### 3<sup>rd</sup> Survey Results:

- Mid-50% = -2.0% to -5.0%
- Mean = -3.4% (■)
- Median = -3.5% (▲)



# Figure 9

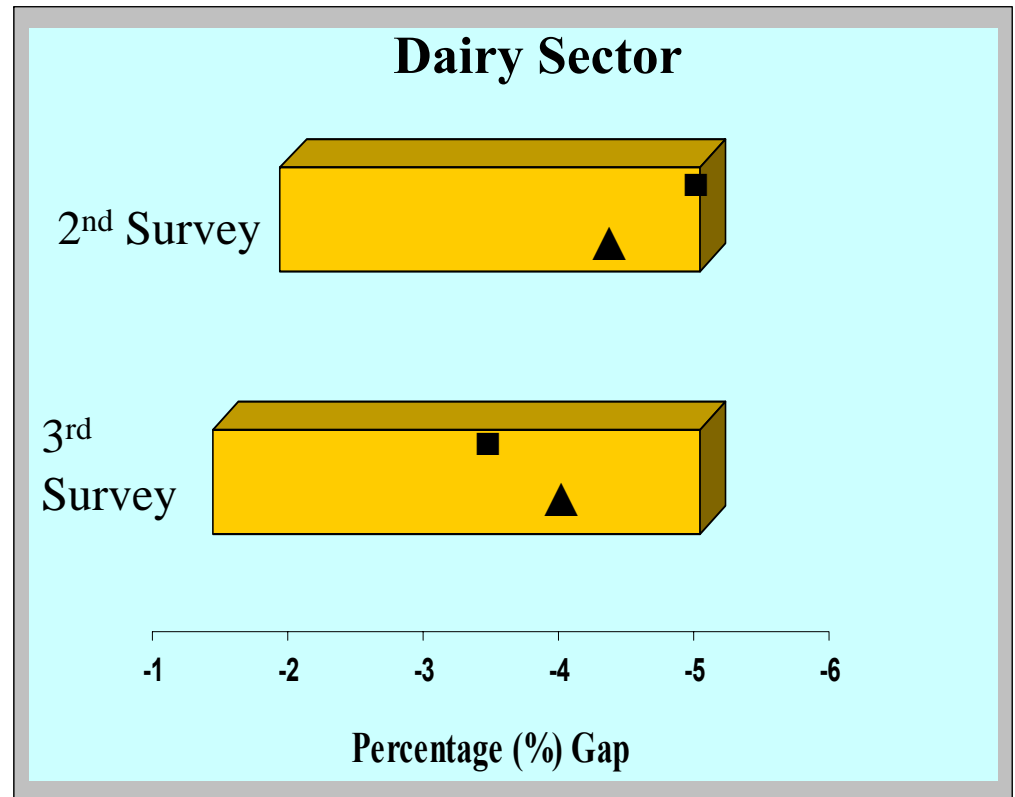
## Medium-Term Shortages (2007-10)

### 2<sup>nd</sup> Survey Results:

- Mid-50%: -2.0% to -5.0%
- Mean = -5.0% (■)
- Median = -4.5% (▲)

### 3<sup>rd</sup> Survey Results:

- Mid-50%: -1.5% to -5.0%
- Mean = -3.5% (■)
- Median = -4.0% (▲)



# Figure 10

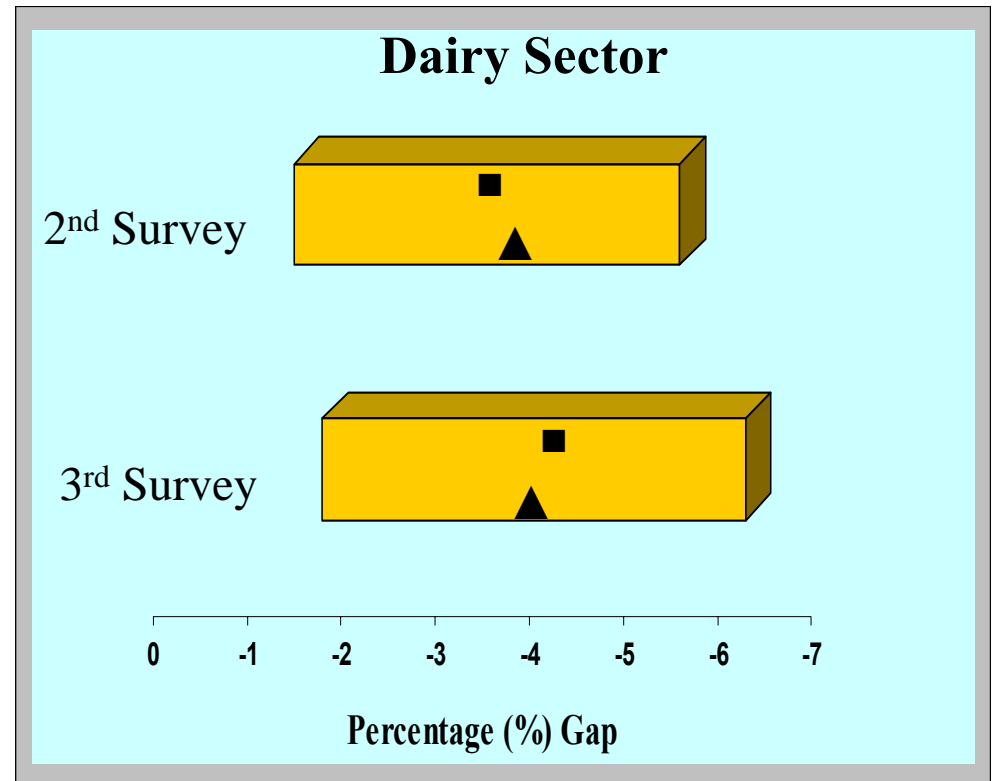
## Long-Term Shortages

### 2<sup>nd</sup> Survey Results:

- Mid-50%: -1.6% to -5.8%
- Mean = -3.5% (■)
- Median = -3.8% (▲)

### 3<sup>rd</sup> Survey Results:

- Mid-50%: -1.8% to -6.4%
- Mean = -4.2 % (■)
- Median = -4.0 % (▲)



# Figure 11

## Summary: Future Shortages

### Short-Term (2004-07):

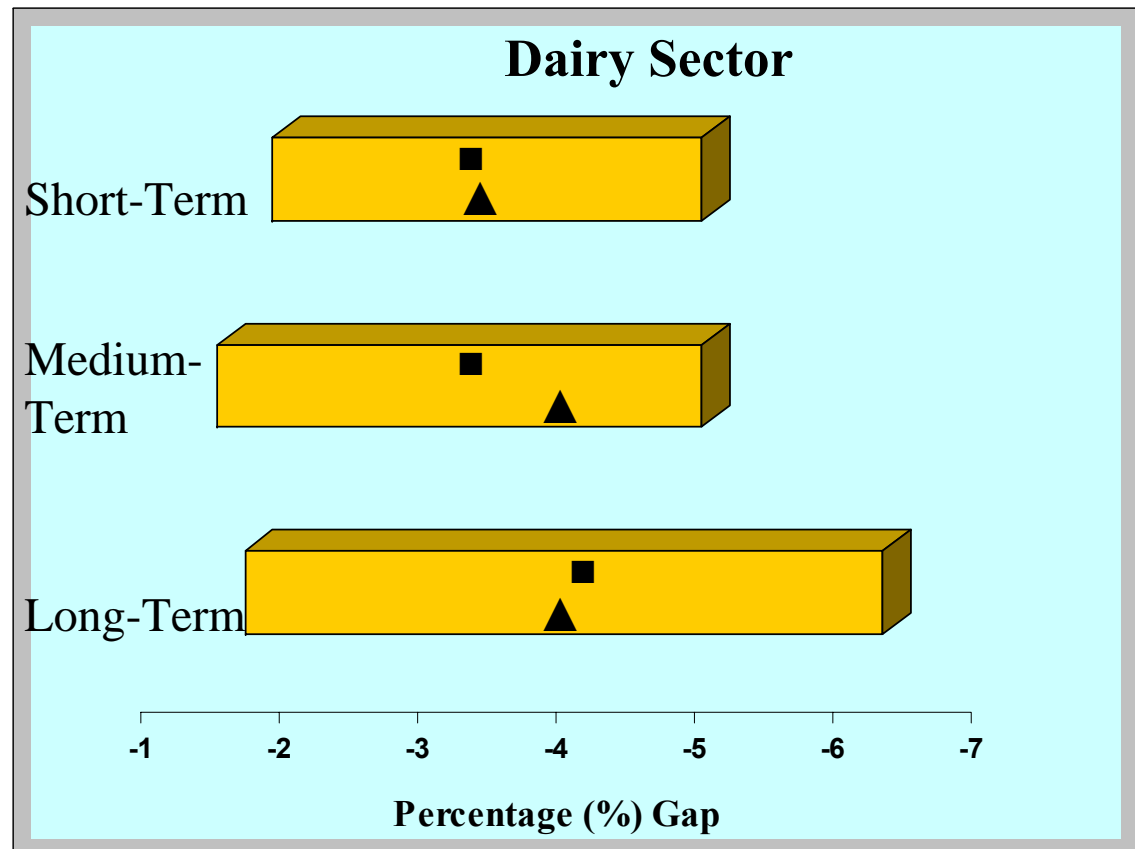
- Mid-50% = -2.0% to -5.0%
- Mean = -3.4% (■)
- Median = -3.5% (▲)

### Medium-Term (2007-10):

- Mid-50%: -1.5% to -5.0%
- Mean = -3.5% (■)
- Median = -4.0% (▲)

### Long-term (2010-16):

- Mid-50%: -1.8% to -6.4%
- Mean = -4.2% (■)
- Median = -4.0% (▲)



Once extreme values well outside of the normal range of the distribution were removed, only one or two panelists ever predicted a surplus. For the final short-term forecast, no member projected a surplus (and only one member predicted a 0% shortage). While there was general consensus that, given current trends and assuming no catastrophic events, consistent shortages are will occur over the foreseeable future, the only area of disagreement within the Delphi panel was over how large these shortages will be. Additional analyses done that compared the shortage estimates of those seeing themselves as forecasting experts with those in the less-expert sub-group. On the important third survey, there were not significant differences between the shortage forecasts of those two sub-groups. Similarly, follow-up analyses contrasting the shortage estimates of panel members focused on Canada versus the US did not find any significant differences.

To better understand the disagreement within the panel about the extent of future shortages, additional analyses were done to determine the factors that differentiated those making more conservative estimates versus those projecting more extreme shortages. A median split, based upon the median shortage estimated over all time periods was used to place panelists into “limited-shortage” and “deeper-shortages” sub-groups. That analysis indicates that those seeing deeper future shortages differ from the more conservative panelists in that they see a significantly *more extreme supply-decreasing* problem associated with:

- Need to work long hours and emergency calls (mean: 2.36 on a 7-point scale in the deeper-shortages sub-group vs. a mean of 2.89 in the limited-shortages sub-group)<sup>10</sup>

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<sup>10</sup> The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future supply of dairy veterinarians. The mean rating in the parentheses is for the sub-group that sees deeper

Those seeing deeper shortages also see the following demand-related factors as having significantly *stronger demand-increasing* influence:

- Availability of highly technical or specialized services (mean: 5.60 on a 7-point scale in the deeper-shortages sub-group vs. 3.44 in the limited-shortages sub-group)<sup>11</sup>
- Veterinary service agreements required for agri-business loans (mean: 5.10 versus 4.33 in the limited-shortages sub-group)
- Move to larger sized producer operations (mean: 5.55 versus 4.77 in the limited-shortages sub-group)
- Client use of veterinary herd management services (mean: 5.90 versus 4.90 in the limited-shortages sub-group)
- Need to understand animal-human health eco-systems (mean: 4.60 versus 4.00 in the limited-shortages sub-group)
- Providing government or legally required services (mean: 5.36 versus 4.70 in the limited-shortages sub-group)
- Delivering more specialized services to large producers (mean: 5.55 versus 4.70 in the limited-shortages sub-group)

Those seeing deeper shortages also see the following demand-related factor as having a significantly *weaker demand-decreasing* influence:

- Slow adoption of new technologies by veterinarians (mean: 3.73 on a 7-point scale in the deeper-shortages sub-group versus 3.30 in the limited-shortage sub-group)

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shortages (those seeing a 5% or higher average shortage) and the second mean is for the limited-shortages sub-group (less than a 5% average shortage). The following scale anchor points will help in the interpretation of those means: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence.

<sup>11</sup> The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future demand for dairy practice veterinarians. The mean rating in the parentheses is for the sub-group that sees deeper shortages (those seeing a 5% or higher average shortage) and the second mean is for the limited-shortages sub-group (less than a 5% average shortage). The following scale anchor points will help in the interpretation of those means: 7. Strong Increase, 6. Increase, 5. Slight Increase, 4. No Influence.

Clearly, the differences between the deeper-shortages versus limited-shortages sub-groups are more driven by differences in how they see demand-related (versus supply-related) factors playing out in the future. Many of the same demand related factors noted above were also rated significantly differently by the decreasing-demand versus increasing-demand sub-groups presented in an earlier section. The theme of increasing-demand panel members seeing opportunities in the consolidation in the dairy industry and providing highly technical specialized services to large dairy operations is also apparent in the contrasts between the deeper- versus limited-shortages subgroups noted above.

# Solutions for the Future Shortage of Dairy Veterinarians

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How can the FSVM profession prepare for a better future and counter the trends that are going to lead to a consistent shortage of veterinarians available to fulfill the need for these professionals? Finding targets of opportunity to improve the future of the food supply veterinary profession has been the main focus of previous sections. To develop those ideas further, 18 potential general solutions to shortages were developed and evaluated by all 13 panels. Their ratings are based on the extent to which each solution will *eliminate* the expected veterinarian shortages. In interpreting the mean ratings noted below, one should keep in mind that a rating of “5” on the 7-point rating scale indicates that a solution is seen as “effective” at *eliminating* the expected shortage. The following are the top 12 rated solutions. These are listed in order of rated effectiveness in eliminating shortages:

1. Student debt repayment and scholarship programs for service in areas of need (mean of 4.86 on a 7-point scale)<sup>12</sup>
2. Reserve class slots for academically qualified students with food supply interests and relevant background (mean of 4.71)
3. Appointment of more food supply faculty at colleges of veterinary medicine (mean of 4.67)
4. Mentoring initiatives for students and those starting a food supply career (mean of 4.57)

*Note that Canada-focused ratings (mean: 6.00) were significantly higher than ratings by US-focused panel members (mean: 4.31).*

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<sup>12</sup> Panel members rated the extent that each possible solution will lead to an *elimination* of a shortage of veterinarians. This high standard should be noted in interpreting the meaning of the mean rating. The following rating scale was used: 1. Not at all Effective, 3. Slightly Effective, 5, Effective, 7. Highly Effective. There were not significant differences in the ratings of expert versus less-expert sub-groups.

5. More involvement of food supply practitioners in training veterinary students (mean of 4.52)
6. Focused recruitment of high school and college students with food supply interests into veterinary colleges (mean of 4.35)  
*Note that the Canada-focused panel member mean of 3.00 is significantly lower than the US-focused sub-group mean of 4.50.*
7. Paid externship requirement in food supply medicine during the summer (mean of 4.24)  
*Note that Canada-focused ratings (mean: 4.00) were significantly higher than ratings by US-focused panel members (mean: 5.67).*
8. Expand the Centers of Excellence concept with a nationally recognized focus on different food supply sectors (mean of 4.10)
9. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities (mean of 4.48)  
*Note that the Canada-focused panel member mean of 3.00 is significantly lower than the US-focused sub-group mean of 4.71.*
10. Expanded paid work-study programs during the final year of the DVM programs (mean of 3.75)
11. Increased focus of food supply coverage early in the DVM curriculum (mean of 3.71)  
*Note that Canada-focused ratings (mean: 5.00) were significantly higher than ratings by US-focused panel members (mean: 3.44).*
12. Expanded postgraduate fellowships in food supply areas (mean of 3.62)

These items represent possible tactics that could be part of a larger strategy for dealing with future shortages. For example, items 1, 2, 4, 6, and 9 focus on increasing interest of pre-veterinary students in FSVM careers, making sure that academically qualified food animal oriented student are admitted, and facilitating their entry into FSVM career positions. These strategies will address both the pre-veterinary student population and also make the food supply track more attractive to veterinary students.

The appointment of more food supply faculty (item 3) along with curricular changes will

facilitate students getting more early exposure to food supply careers (item 11) and the use of more practitioners (item 5), could be used to augment scarce faculty resource in educating students. Items 7, 10, and 12 are educational strategies for giving students more hands-on FSVM work experiences during training. Besides helping students develop skills in this area, these externships and postgraduate fellowships provide bridges to post-graduation FSVM jobs. This lessens the likelihood of being attracted to alternative employment. The Centers of Excellence concept (item 3) is a large scale strategy that that could build in a number of other highly rated solutions. A dairy practice-focused Center of Excellence could be a means for delivering more hands-on experience, obtaining more faculty resources to teach them, and attracting more students.

## **Conclusion: A Need for Action**

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The data from this study reveals a clear pattern of increasing demand and significant future shortages in the food supply veterinary medicine profession. The Veterinarian's Oath clearly states the obligation of this profession in servicing the needs of society. If the projected shortages are allowed to unfold along the currently forecasted course, the profession will not fulfill its professional obligation! Animal health will suffer as will food safety and human health.

One possible interpretation of the data is that if dairy veterinarians are not prepared for the challenges of providing high value added services to the large dairy operations, then there will not be the future demand increases and shortages that the majority of the panel experts are forecasting. While such inaction may avert of shortages, it will not improve the profession and better serve the interests of the food supply system, the dairy industry or society. No action is hardly an appropriate strategic response.

A clear premise of this research is the future that we will live in tomorrow is created by action we take today. While there are larger trends (such as urbanization and consolidation in the dairy industry) that will not be changed and must be adjusted to and managed around, the future is not a deterministic function of unchangeable large social and economic forces. It is very much created by our choices. Many of the trends and issues shaping the future of the food supply veterinary profession are created by choices that can be thoughtfully reviewed and revised. Strategic actions implemented in the near-term can change the trends that will otherwise shape a future that is not good for dairy

practice veterinarians or society. If action is not taken to address the future shortages then others will likely attempt to fill the void created. This is already being seen. We should not expect, however, that the unplanned responses that will emerge to fill the void caused by shortages will avert the negative economic impact and challenges to societal well-being that the lack of adequate numbers of dairy practice veterinarians will create. The veterinary profession can do better! Fulfilling its credo and responsibilities to society requires immediate strategic action to counter these trends.

The shortages forecasted for dairy practice veterinarians are conservative. The range of shortages noted by the middle 50% of panel experts are based on the assumption that no major disease, agro-terrorism or other severe or catastrophic events will occur. It is one thing to hope for such luck; it is another thing to plan for this rosy scenario! History tells us we must be prepared now to counter such events.

While supply and demand issues are ultimately intertwined, one clear message that dealing with the supply of dairy veterinarians issues is the first priority. This is clear from the listing of highly rated solutions-to-shortages noted in the previous section. Producing adequate numbers of new dairy veterinarians will counter the retirements and that are likely to retire in the next few years. If they have the skills to help increasingly large dairy operations in ways that make that industry effective, then we will see higher demand for those services. This will be in a context of food science specialists, veterinary technicians and other staff members doing things that have previously been done by veterinarians. If the FSVM professions prepares for this future, those other staff members will provide animal health services that are appropriate for their skills and at the directions of dairy veterinarians. The paradox of this scenario is that this will create

higher demand and some continuing concerns about shortages. However, this is a much better problem to have than the alternative!

The planning matrix presented with several analyses provides guidance on the opportunities and constraints that must be considered in planning future action. This is, however, only a starting point. The profession must address where its strengths and weaknesses are in moving beyond these starting points. Thoughtful leaders in the larger profession need to identify where they have the best advantage to take effective collective action. All professions have strengths and weaknesses; effective leaders understand how to leverage their strengths while being mindful of their weaknesses. The identified solutions provide a starting point for developing effective elements of an effective coherent strategy of collective action.

## Supplemental Information

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The following additional information is provided to help the reader understand the results reported in this chapter:

1. Temporary links to the three the dairy practice surveys are noted, but these will not be available indefinitely. The larger final report, which presents the results of Delphi panels focused on other sectors, includes a sample copy of three surveys for one selected panel. While the first survey was quite similar in all 13 panels, the nature of the Delphi process resulted in questions that formed unique surveys for the second and third rounds of each panel. However, the larger designs of all second- and all third-round survey are very similar. Try these web-links to view a copy of the three surveys completed by the dairy panel:
  - a. First Survey: <http://survey.cba.ksu.edu/prince/dairy1/index.htm>
  - b. Second Survey: <http://survey.cba.ksu.edu/prince/dairy2/index.htm>
  - c. Third Survey: <http://survey.cba.ksu.edu/prince/dairy3/index.htm>
2. Exhibit A provides a listing of all members that completed at least the first survey.
3. Exhibits B and C provides copies of the interim feedback reports that accompanied the second and third surveys. The first report (Exhibit B) summarizes trends found in the first survey data and provides guidance for interpreting the feedback incorporated into the second survey. The second report (Exhibit C) serves a similar function for the second survey data trend and accompanied the third survey.

4. Exhibit D provides a summary of the data results for major sections of the three surveys completed by the dairy practice panel.

Exhibit A

Original Dairy Practice Delphi Panel  
Members<sup>13</sup>

- |                   |                       |
|-------------------|-----------------------|
| 1. Gord Atkins    | 13. Gordon Jones      |
| 2. Emile Bouchard | 14. Greg Keefe        |
| 3. James Brett    | 15. Greg Kurtz        |
| 4. Bob Corbett    | 16. John Lee          |
| 5. Chris Cripps   | 17. Michael Lormore   |
| 6. James Cullor   | 18. Rich Meiring      |
| 7. Angela Daniels | 19. Kenneth Nordlund  |
| 8. Gale DeJong    | 20. Gatz Riddell      |
| 9. Greg Edwards   | 21. Dan Smith         |
| 10. Ewen Ferguson | 22. Martin Tiemann    |
| 11. John Fetrow   | 23. Stephen Wadsworth |
| 12. Don Gardner   | 24. Richard Wiley     |

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<sup>13</sup> Note that not all panel members completed all three surveys. These individuals originally agreed to participate.

## Dairy Panel

### 1st Survey Interim Feedback Report

6 May 2005

This report summarizes replies to the 1<sup>st</sup> survey of the Dairy Delphi forecasting panel. *This brief report is focused on helping you be more informed as you complete the 2<sup>nd</sup> survey.* (A full summary of the Dairy panel's data will be provided after you complete the 3<sup>rd</sup> survey.)

This report identifies a few key patterns and more specific information from the 1<sup>st</sup> survey is included in the 2<sup>nd</sup> survey. Questions where there was more disagreement are repeated in the 2<sup>nd</sup> survey and panel averages and the ranges of the middle 50% of replies (between the 25% and 75% percentiles) are noted in that survey. When there is a difference between self-rated forecasting “experts” (i.e., those rating themselves as better than the panel's median score on question #30 of the 1<sup>st</sup> survey) versus those rating themselves as “less expert” in making forecasts, then those contrasts are noted. Where Canadian & US members had a rating difference of .5 or more (on the 7-point scale), those respective means are noted. For example, item #1 in the first section of the 2<sup>nd</sup> survey, (“Availability of highly technical or specialized services”) has the following notation:

*“Average = 4.6 & Mid-50% = 4 to 6; Experts = 5.0 (vs. 4.0).”*

This indicates that the mean of the panel was 4.6 on a 7-point scale (between “4. No Influence” and “5. Slight Increase”) and the middle-50% of panelists rated it 4, 5 or 6 (“4. No Influence” to “6. Increase”). Self-rated “experts” had a significantly higher mean rating (mean = 5.0) than the “less expert” group mean of 4.0. There were no difference between Canadian and US means.

***Please review this feedback before (or as) you complete the 2<sup>nd</sup> survey.***

### **I. Factors Influencing Demand for Veterinarians in Dairy Careers**

The first section in the 1<sup>st</sup> survey asked you to rate the influence of 25 different demand related issues. The top-rated influences seen as *increasing* future demand are:

- Public concerns over food safety
- Required 3<sup>rd</sup>-party certification or verification of standards
- Zoonotic disease-related human health concerns
- Client use of veterinary herd management services

The top-rated influences *decreasing* future demand are:

- Move to larger sized producer operations
- Lack of veterinarian's practice management & business skill
- Slow adoption of new technologies by veterinarians

## II. Future Demand Estimates for Dairy Food Supply Veterinarians

The mean value for the general forecast of future demand from the 1<sup>st</sup> Survey is 4.1 (just over “4. Stay Exactly the Same”). No panel member actually selected #4! Nearly 40% saw a decrease (and marked 1, 2 or 3) while the rest saw an increase (and marked 5 or 6) in demand. The most frequently checked rating was “5. Increase Slightly”. The middle 50% (between the 25<sup>th</sup> to 75<sup>th</sup> percentiles) rated demand as 3, 4 or 5. There was not a different pattern rating between self-rated experts (vs. less expert forecasters) or Canadians vs. US members.

Additional questions asked for the “most likely” range of changes in future demand for several time periods. The mid-points of those range estimates were used as the average. Approximately one-third saw *decreasing* demand (negative numbers) and the rest saw *increasing* demand for the near-term future projections.

Panel members seeing *increasing* demand (compared to those seeing *decreasing* demand) rated the following “demand influences” (from question 1, 1<sup>st</sup> survey) as having a significantly *more positive (or less negative)* influence on demand:

- Use of non-DVMs, such as veterinary technicians
- Availability of highly technical or specialized services
- Move to larger sized producer operations

There was not any pattern of “expert” forecasters or Canadians making different future projections. Experts did see the “Availability of highly technical or specialized services,” as a neutral to positive influence on demand while the “less expert” group gave significantly lower (neutral to negative) ratings on this influence.

## III. Factors Influencing the Supply for Dairy Food Supply Veterinarians

The more extreme negative influences on the future supply for Dairy food supply veterinarians (low ratings on the question #10 items from the 1<sup>st</sup> survey) are:

- Less emphasis on food animal practice in veterinary colleges
- More women veterinarians entering the workforce
- Little exposure to food supply career options in college
- Need to work long hours and emergency calls
- Lack of spousal career option in rural areas

#### **IV. Projected Shortage or Surplus of Veterinarians**

In spite of having 40% of panel members forecast decreasing demand (see section II above), there is a consistent pattern of projected shortages. While there is agreement that shortages are likely, it is striking how varied those estimates are. There were not consistent differences in Canadian versus US and expert versus less-expert comparisons. Analysis of the “supply factors” (discussed in the prior section) found that those seeing higher shortages tended to see the “Need to work long hours and emergency calls” as a significantly more negative influence on supply. The expert vs. less-expert sub-groups did not see the other supply factors differently.

#### **Next Steps...**

The patterns that are starting to emerge tell an interesting story for DVMs in dairy careers and one that is distinct from other career areas! Your replies to the second survey will add to this story.

Thank you for your continuing help and involvement!

Dr. J. Bruce Prince  
Professor of Management  
Kansas State University  
785-532-7459  
[jbprince@ksu.edu](mailto:jbprince@ksu.edu)

## **Dairy Panel**

### 2<sup>nd</sup> Survey Interim Feedback Report

This report summarizes replies to the 2<sup>nd</sup> survey of the Dairy Delphi panel. *This brief report is focused on helping you be more informed as you complete the 2<sup>nd</sup> survey.* (A full summary of the Dairy panel's data will be provided after I analyze the 3<sup>rd</sup> survey.)

This report identifies a few key patterns and more specific information from the 2<sup>nd</sup> survey is included in the 3<sup>rd</sup> survey. Questions where there was more disagreement are repeated in the 3<sup>rd</sup> survey and panel averages and the ranges of the middle 50% of replies (between the 25% and 75% percentiles) are noted in that survey. When there is a difference between self-rated forecasting “experts” versus those rating themselves as “less expert” in making forecasts, then those contrasts are noted. Where Canadian & US members had a rating difference of .5 or more (on the 7-point scale), those respective averages are noted. For example, item #1 in the first section of the 3<sup>rd</sup> survey, (“Use of non-DVMs, such as veterinary technicians”) has the following notation:

*“Average=3.5 & Mid-50% = 3 to 4; Experts = 3.8 (vs. 3.1).”*

This indicates that the average of the panel was 3.5 on a 7-point scale (between “3. Slight Decrease” and “4. No Influence”) and the middle-50% of panelists rated it 3 or 4 (“3. Slight Decrease” and “4. No Influence”). Self-rated “experts” had a significantly higher average rating (mean = 3.8) than the “less expert” subgroup (mean = 3.1). There were no difference between Canadian and US subgroup ratings. Statistical information from the 2<sup>nd</sup> survey will be presented in this format throughout the 3<sup>rd</sup> survey.

***Please review this feedback before (or as) you complete the 3<sup>rd</sup> survey.***

## **V. Factors Influencing Demand for Veterinarians in Dairy Careers**

The first section in the 1<sup>st</sup> survey asked you to rate the influence of 25 different demand related issues. Several of these plus new items suggested by the panel were included in the 2<sup>nd</sup> survey. The top-rated influences seen as *increasing* future demand from both surveys are:

- Public concerns over food safety
- Delivering more specialized services to large producers
- Using broad expertise as part of the production management team
- Client use of veterinary herd management services
- Required 3<sup>rd</sup>-party certification or verification of standards
- Zoonotic disease-related human health concerns

The top-rated influences *decreasing* future demand (from both surveys) are:

- Less demand for “sick animal” services
- Non-DVM producer staff doing work previously done by DVMs
- Slow adoption of new technologies by veterinarians
- Move to larger sized producer operations
- Lack of veterinarian’s practice management & business skill

## VI. Future Demand Estimates for Dairy Food Supply Veterinarians

The average value for the general forecast of future demand from the 2<sup>nd</sup> survey is 4.2 (just over “4. Stay Exactly the Same”). No panel member actually selected #4! Nearly 40% saw a decrease (and marked 2 or 3) while the rest saw an increase in demand (and marked 5 or 6). 52% marked “5. Increase Slightly.” The middle 50% (between the 25<sup>th</sup> to 75<sup>th</sup> percentiles) rated demand as 3, 4 or 5. There was not a different rating pattern between self-rated experts and less expert forecasters or between Canadians and US members.

Additional questions asked for the “most likely” estimate of changes in future demand for several time periods. 35% consistently saw *decreasing* demand (negative numbers) and 65% saw *increasing* demand for future time periods. The average rating was a +2.0% increase and the middle 50% ratings always included 0% (no change).

Panel members seeing *increasing* demand (compared to those seeing *decreasing* demand) rated each of the following “demand influences” (from question 1, 2<sup>nd</sup> survey) as having a significantly *more positive (or less negative)* influence on demand:

- Delivering more specialized services to large producers
- Using broad expertise as part of the production management team
- Client use of veterinary herd management services
- Providing government or legally required services
- Move to larger sized producer operations
- Availability of highly technical or specialized services

It appears that those projecting increasing demand see new opportunities in serving increasingly large dairy operations. Those projecting decreasing demand see constraints in the consolidation within the dairy industry. While “expert” forecasters and Canadians tended to make higher future projections, these differences were statistically weak patterns.

Selected activities and skills where there was uniquely higher or lower demand were identified in the 1<sup>st</sup> survey and rated in the 2<sup>nd</sup> survey. Health management and herd

production services, training staff in large operations and milk quality consulting are areas of the highest increasing demand. Treating sick animals and doing vaccinations, surgery and pregnancy diagnosis are areas of diminishing demand.

## **VII. Factors Influencing the Supply for Dairy Food Supply Veterinarians**

The more extreme *negative* influences on the future supply for Dairy food supply veterinarians noted in the two previous surveys are:

- Less emphasis on food animal practice in veterinary colleges
- More women veterinarians entering the workforce
- Little exposure to food supply career options in college
- Need to work long hours and emergency calls
- Lack of spousal career options in rural areas
- Selection of students with non-farm backgrounds into veterinary schools

Questions #7 in the 3rd survey presents the supply constraint questions where there is some disagreement within the panel.

## **VIII. Projected Shortage or Surplus of Dairy Food Supply Veterinarians**

In spite of having 35% of panel members forecasting decreasing demand (see section II above), there is a consistent pattern of projected shortages. The question on the general forecast (see question #9, 3<sup>rd</sup> survey) produced an average of just over “5. Slight Shortage” (mean=5.1). Over 75% of the panel members noted a shortage and almost 50% marked “6. Shortage.” The specific estimates projected shortages of -3.0% to -.5% and the middle 50% (between the 25<sup>th</sup> and 75<sup>th</sup> percentile) always predicted a shortage. There were not consistent differences in Canadian versus US and expert versus less-expert comparisons. Analysis of the “supply factors” (see section III above) did not reveal any differences between those seeing higher shortages versus lower shortages. Four “demand influencing factors” (see section I above) that were rated significantly higher (*more positive or less negative*) by those panel members seeing higher than average shortages are:

- Client use of veterinary herd management services
- Delivering more specialized services to large producers
- Using broad expertise as part of the production management team
- Less demand for “sick animal” services

### **Next Steps...**

The patterns flagged in the 1<sup>st</sup> survey have become clearer in the 2<sup>nd</sup> survey. This presents a unique and interesting story for DVMs in dairy careers. Your replies to the third and final survey will add to and clarify this story even more. Besides making the final estimates to some previously seen questions, you will evaluate several potential solutions for the shortage problem noted above.

Thank you for your continuing help and involvement!

Dr. J. Bruce Prince  
Professor of Management  
Kansas State University  
785-532-7459  
[jbprince@ksu.edu](mailto:jbprince@ksu.edu)

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## Exhibit D

### Section I. Factors Influencing Future Demand for Veterinarians in the Dairy FSVM Careers

Survey Item	Survey Wave <sup>14</sup>	% Decrease <sup>15</sup>	% No Influence	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Public concerns over food safety	1 <sup>st</sup>	50	36.4	13.6	5.7	.86	5 to 6	21
2. Use of non-DVMs, such as veterinary technicians	1 <sup>st</sup>	30	60	10	3.7	1.27	3 to 4	20
2. Use of non-DVMs, such as veterinary technicians	2 <sup>nd</sup>	50	36.4	13.6	3.5	1.10	3 to 4	22
2. Use of non-DVMs, such as veterinary technicians	3 <sup>rd</sup>	54.5	31.8	13.6	3.5	1.06	3 to 4	22
3. Public concerns over bio-terrorism	1 <sup>st</sup>	0	28.6	71.4	5.1	.87	4 to 6	21
4. Zoonotic disease-related human health concerns	1 <sup>st</sup>	0	19	81	5.2	.77	5 to 6	21
5. Required third-party certification or verification of standards	1 <sup>st</sup>	0	21.1	78.9	5.3	.87	5 to 6	19
6. Limited public understanding of food quality and safety issues	1 <sup>st</sup>	4.8	66.7	28.6	4.3	.73	4 to 5	21
7. More meat consumption in the US and Canada	1 <sup>st</sup>	0	65	35	4.5	.67	4 to 5	20
8. More access to global markets for food exports	1 <sup>st</sup>	4.8	33.3	61.9	4.8	.87	4 to 5.5	21
9. Changing dietary habits in third-world countries	1 <sup>st</sup>	0	52.9	47.1	4.5	.62	4 to 5	17
10. Need to protect indigenous wildlife from exotic diseases	1 <sup>st</sup>	5	75	20	4.2	.49	4 to 4	20
11. Federal and/or state/provincial budgetary constraints	1 <sup>st</sup>	57.1	33.3	9.5	3.5	.87	3 to 4	21
12. Curtailment of government support of veterinary services	1 <sup>st</sup>	50	35	15	3.7	.93	3 to 4	20
12. Curtailment of government support of veterinary services	2 <sup>nd</sup>	30	65	5	3.8	.79	3 to 4	20
13. Increasing concern for animal wildlife	1 <sup>st</sup>	0	25	75	5.0	.80	4.3 to 5	20
14. Increasing concern for animal health	1 <sup>st</sup>	0	36.8	63.2	4.8	.83	4 to 5	19
15. Need to understand animal-human health eco-systems	1 <sup>st</sup>	0	76.5	23.5	4.4	.70	4 to 4.5	17
16. Availability of highly technical or specialized services	1 <sup>st</sup>	20	15	65	4.6	1.43	4 to 6	20
16. Availability of highly technical or specialized services	2 <sup>nd</sup>	9.1	4.5	86.4	5.1	.94	5 to 6	22
17. Veterinary services agreements required for agri-business loans	1 <sup>st</sup>	0	35	65	4.8	.64	4 to 5	20
18. Growing need to track animals entering the food chain	1 <sup>st</sup>	0	23.8	76.2	5.1	.87	4.5 to 5	21
19. Constraints on non-DVMs giving prescription drugs	1 <sup>st</sup>	0	61.1	38.9	4.5	.71	4 to 5	18
20. Slow adoption of new technologies by veterinarians	1 <sup>st</sup>	55.6	38.9	5.6	3.2	.94	2 to 4	18

<sup>14</sup> The “1<sup>st</sup>” refers to the 1<sup>st</sup> Delphi survey. The “2<sup>nd</sup>” refers to the 2<sup>nd</sup> Delphi survey, while the “3<sup>rd</sup>” refers to the 3<sup>rd</sup> Delphi survey.

<sup>15</sup> The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.

20. Slow adoption of new technologies by veterinarians	2 <sup>nd</sup>	77.3	13.6	9.1	3.1	1.09	2 to 3.3	22
20. Slow adoption of new technologies by veterinarians	3 <sup>rd</sup>	77.3	22.7	0	3.1	.72	3 to 3.3	22
21. Move to larger sized producer operations	1 <sup>st</sup>	71.4	4.8	23.8	3.2	1.40	2.5 to 4.5	21
21. Move to larger sized producer operations	2 <sup>nd</sup>	63.6	13.6	22.7	3.3	1.45	2 to 4.3	22
21. Move to larger sized producer operations	3 <sup>rd</sup>	72.7	18.2	9.1	3.1	.97	2.8 to 4	22
22. Client use of veterinary herd management services	1 <sup>st</sup>	4.8	9.5	85.7	5.2	.94	5 to 6	21
22. Client use of veterinary herd management services	2 <sup>nd</sup>	9.5	0	90.5	5.3	.91	5 to 6	21
23. Client concerns about veterinary service costs	1 <sup>st</sup>	33.3	66.7	0	3.6	.68	3 to 4	21
24. Lack of veterinarian's practice management and business skill	1 <sup>st</sup>	57.9	42.1	0	3.2	.90	3 to 4	19
25. Part-time farmers needing more veterinary services	1 <sup>st</sup>	0	68.4	31.6	4.5	.91	4 to 5	19
38. Delivering more specialized services to large producers	2 <sup>nd</sup>	9.1	0	90.9	5.6	1.10	5 to 6	22
38. Delivering more specialized services to large producers	3 <sup>rd</sup>	13.6	0	86.4	5.1	1.17	5 to 6	22
39. Using broad expertise as part of the production management team	2 <sup>nd</sup>	9.1	0	90.9	5.4	1.01	5 to 6	22
39. Using broad expertise as part of the production management team	3 <sup>rd</sup>	4.5	4.5	90.9	5.5	.86	5 to 6	22
40. Providing government or legally required services	2 <sup>nd</sup>	0	31.8	68.2	5.0	.82	4 to 6	22
41. Training non-DVM staff at large producers	2 <sup>nd</sup>	36.4	18.2	45.5	4.5	1.41	3 to 6	22
41. Training non-DVM staff at large producers	3 <sup>rd</sup>	13.6	22.7	63.6	4.9	1.36	4 to 6	22
42. New DVMs replacing retirees	2 <sup>nd</sup>	31.8	22.7	45.5	4.4	1.26	3 to 5.3	22
42. New DVMs replacing retirees	3 <sup>rd</sup>	18.2	9.1	72.7	4.7	1.12	4 to 5.3	22
43. Non-DVM producer staff doing work previously done by DVMs	2 <sup>nd</sup>	81.8	9.1	9.1	2.8	1.05	2 to 3	22
43. Non-DVM producer staff doing work previously done by DVMs	3 <sup>rd</sup>	72.7	18.2	91.	3.1	1.11	2 to 4	22
44. Less demand for "sick animal" services	2 <sup>nd</sup>	90.5	9.5	0	2.6	.74	2 to 3	21

## Section II. Specialized Activities Increasing or Decreasing in Demand Relative to the General Pattern

Survey Item	Survey Wave	% Lower <sup>16</sup>	% No Difference	% Higher	Mean	Standard Deviation	Middle 50% Range	N
1. Herd production services	2 <sup>nd</sup>	0	4.5	95.5	5.6	.74	5 to 6	22
2. Health management services	2 <sup>nd</sup>	0	0	100	5.7	.72	5 to 6	22
3. Milk quality consulting	2 <sup>nd</sup>	4.5	9.1	86.4	5.3	.84	5 to 6	22
4. Nutrition consulting	2 <sup>nd</sup>	4.8	4.8	90.5	5.1	.94	5 to 5.5	21
5. Training staff at large operations	2 <sup>nd</sup>	9.1	9.1	81.8	5.4	1.33	5 to 6.3	22
6. Diagnosis and disease control services	2 <sup>nd</sup>	22.7	22.7	54.5	4.4	1.22	3.8 to 5	22
7. Reproductive medicine for herds	2 <sup>nd</sup>	27.3	36.4	36.4	4.1	.97	3 to 5	22
8. Sick animal services	2 <sup>nd</sup>	86.4	4.5	9.1	2.6	1.26	2 to 3	22
9. Vaccinations and dispensing prescriptions	2 <sup>nd</sup>	68.2	13.6	18.2	2.9	1.42	1.8 to 4	22
10. Pregnancy diagnosis	2 <sup>nd</sup>	57.1	28.6	14.3	3.3	1.02	2.5 to 4	21
11. Surgery	2 <sup>nd</sup>	54.5	40.9	4.5	3.1	1.08	2 to 4	22

<sup>16</sup> The “% Lower” is the percentage that marked 1, 2 or 3. This ranges from “Significantly Lower” to “Slightly Lower” on the 7-point scale. The “% No Difference” is the percent that marked 4. This is the mid-point of the scale. The “% Higher” is the percentage marking 5, 6 or 7, which ranged from “Slightly Higher” to “Significantly Higher.”

### Section III. Factors Influencing Future Supply for Veterinarians in the Dairy FSVM Careers

Survey Item	Survey Wave	% Decrease <sup>17</sup>	% No Influence	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Less emphasis on food animal practice in veterinary colleges	1 <sup>st</sup>				1.9	.66	1 to 2	21
2. More women veterinarians entering the workforce	1 <sup>st</sup>				2.4	1.12	1.5 to 3	21
2. More women veterinarians entering the workforce	2 <sup>nd</sup>	72.7	13.6	13.6	2.9	1.41	2 to 4	22
2. More women veterinarians entering the workforce	3 <sup>rd</sup>	72.7	18.2	9.1	3.0	1.11	2 to 4	22
3. Physical demand of large animal veterinary work	1 <sup>st</sup>				3.0	.71	2.5 to 3.5	21
4. Need to work long hours and emergency calls	1 <sup>st</sup>				2.6	.68	2 to 3	21
5. Little exposure to food supply career options in college	1 <sup>st</sup>				2.4	.87	2 to 3	21
6. Lack of food supply practice-related externships for students	1 <sup>st</sup>				3.2	.70	3 to 4	20
6. Lack of food supply practice-related externships for students	2 <sup>nd</sup>	66.7	33.3	0	3.2	.63	3 to 4	21
7. Lack of positive role models in veterinary food supply practice	1 <sup>st</sup>				2.9	1.15	2 to 4	19
8. Poor income opportunities in rural areas	1 <sup>st</sup>				3.3	.81	3 to 4	19
9. Lack of cultural and recreational opportunities in rural areas	1 <sup>st</sup>				3.4	1.01	3 to 4	19
9. Lack of cultural and recreational opportunities in rural areas	2 <sup>nd</sup>	61.9	38.1	0	3.2	.70	3 to 4	21
10. Lack of spousal career options in rural areas	1 <sup>st</sup>				2.8	1.00	2 to 4	21
10. Lack of spousal career options in rural areas	2 <sup>nd</sup>	81.8	13.6	4.5	2.9	.81	2 to 3	22
11. Limited lifestyle and career opportunities in rural areas	1 <sup>st</sup>				3.3	1.01	3 to 4	21
11. Limited lifestyle and career opportunities in rural areas	2 <sup>nd</sup>	68.2	18.2	13.6	3.4	.85	3 to 4	22
12. Federal and/or state/provincial budgetary constraints	1 <sup>st</sup>				3.5	.79	3. to 4	18
13. High debt load of veterinary school graduates	1 <sup>st</sup>				3.0	1.00	2 to 4	20
13. High debt load of veterinary school graduates	2 <sup>nd</sup>	59.1	36.4	4.5	3.2	1.10	2 to 4	22
14. Expected high number of food supply veterinarians retiring in the near future	1 <sup>st</sup>				3.8	1.78	2.5 to 5	21
14. Expected high number of food supply veterinarians retiring in the near future	2 <sup>nd</sup>	59.1	9.1	31.8	3.6	1.37	3 to 5	22
14. Expected high number of food supply veterinarians retiring in the near future	3 <sup>rd</sup>	59.1	9.1	31.8	3.8	1.41	3 to 5	22

<sup>17</sup> The “% Decrease” is the percentage that marked 1, 2 or 3. This ranges from a “Strong Decrease” to “Slight Decrease” on the 7-point scale. The “% No Influence” is the percentage marking “No Influence.” It is the mid-point of the scale. The “% Increase” is the percentage marking 5, 6 or 7, which ranged from “Slight Increase” to “Strong Increase.” Those marking “no trend” or “no opinion” are excluded.

15. Limited capacity of existing veterinary colleges in the US and/or Canada	1 <sup>st</sup>				3.7	1.18	3.3 to 4	20
15. Limited capacity of existing veterinary colleges in the US and/or Canada	2 <sup>nd</sup>	36.4	63.6	0	3.6	.59	3 to 4	22
16. Perceived lack of demand for food animals	1 <sup>st</sup>				3.3	.75	3 to 4	19
17. Requirement for education beyond a DVM	1 <sup>st</sup>				3.4	.62	3 to 4	18
25. Initiatives targeting recruitment and selection of FSVM-oriented students into colleges of veterinary medicine	2 <sup>nd</sup>	15	15	70	4.7	.92	4 to 5	20
25. Initiatives targeting recruitment and selection of FSVM-oriented students into colleges of veterinary medicine	3 <sup>rd</sup>	0	14.3	85.7	5.0	.50	5 to 5	21
26. Salaries available in dairy practice careers	2 <sup>nd</sup>	27.3	36.4	36.4	4.2	1.10	3 to 5	22
26. Salaries available in dairy practice careers	3 <sup>rd</sup>	27.3	36.4	36.4	4.1	1.04	3 to 5	22
27. Opportunities in other areas of veterinary medicine	2 <sup>nd</sup>	68.2	27.3	4.5	3.1	.87	2 to 4	22
28. Selection of students with non-farm backgrounds into veterinary schools	2 <sup>nd</sup>	77.3	18.2	4.5	2.9	.87	2 to 3.3	22

## Section IV. Solutions to Shortages in Dairy Practice

Survey Item	Survey Wave	% Less Effective <sup>18</sup>	% Effective	% Highly Effective	Mean	Standard Deviation	Middle 50% Range	N
1. Reserve class slots for academically qualified students with food supply interests and relevant background	3 <sup>rd</sup>	33.3	28.6	38.1	4.7	1.71	3 to 6	21
2. Expand the Centers for Excellence concept where nationally recognized focus on different food supply sectors	3 <sup>rd</sup>	38.1	47.6	14.3	4.1	1.58	3 to 5	21
3. Focused recruitment of high school and college students with food supply interests into veterinary colleges	3 <sup>rd</sup>	35	45	20	4.4	1.42	3 to 5	20
4. Increased focus of food supply coverage early in DVM curriculum	3 <sup>rd</sup>	42.9	52.4	4.8	3.7	1.42	3 to 5	21
5. Expanded business and practice management coverage in DVM curriculum	3 <sup>rd</sup>	66.7	28.6	4.8	3.1	1.34	2 to 4	21
6. Expanded postgraduate fellowships in food supply areas	3 <sup>rd</sup>	47.6	47.6	4.8	3.6	1.47	2.5 to 5	21
7. Expanded paid work-study programs during the final year of DVM	3 <sup>rd</sup>	50	35	15	3.8	1.55	3 to 5	20
8. More involvement of food supply practitioners in training veterinary students	3 <sup>rd</sup>	33.3	42.9	23.8	4.5	1.50	3 to 5.5	21
9. Provide expanded job placement services in the food supply veterinary medicine areas	3 <sup>rd</sup>	60	30	10	3.6	1.32	3 to 4.8	20
10. Appointment of more food supply faculty at colleges of veterinary medicine	3 <sup>rd</sup>	28.6	52.4	19	4.7	1.43	3 to 5	21
11. Paid externship requirement in food supply medicine during the summer	3 <sup>rd</sup>	38.1	42.9	19	4.2	1.51	3 to 5	21
12. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities	3 <sup>rd</sup>	47.6	33.3	19	3.9	1.81	2.5 to 5	21
13. Student debt repayment and scholarship programs for service in food supply areas of need	3 <sup>rd</sup>	28.6	28.6	42.9	4.9	1.49	3 to 6	21
14. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities	3 <sup>rd</sup>	65	30	5	3.2	1.54	2 to 4.8	20

<sup>18</sup> The “% Less Effective” is the percentage that marked 1, 2 or 3. This ranges from “Not at all Effective to Slightly Effective” on the 7-point scale. The “% Effective” is the percentage marking 4 or 5 where 5 is “Effective.” The “% Highly Effective” is the percentage marking 6 or 7 where 7 is “Highly Effective.”

15. Low cost (subsidized) consulting in business and practice management for new food supply DVMs	3 <sup>rd</sup>	70	25	5	2.8	1.44	2 to 4	20
16. Mentoring initiatives for students and those starting a food supply career	3 <sup>rd</sup>	28.6	47.6	23.8	4.6	1.40	3 to 5.5	21
17. Focused recruitment of women students in food supply areas	3 <sup>rd</sup>	71.4	28.6	0	2.9	1.26	2 to 4	21
18. Development and dissemination of Business Best Practices for food supply veterinary enterprises	3 <sup>rd</sup>	68.4	21.1	10.5	3.2	1.50	2 to 4	19