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## **Chapter 2**

# **The Future Demand for Food Supply Veterinarians in Academic Careers**

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# Introduction

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This study provides a systematic critique of the likely future demand and potential shortages for food supply veterinary medicine (FSVM) professionals employed in academic institutions. Six inter-related questions are addressed:

- I. What are the issues and trends likely to drive the future demand for food supply veterinarians in academe?
- II. Assuming a continuation of currently unfolding trends and the absence of major catastrophic events, what will be the demand for academic food supply veterinarians over the next several years?
- III. 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 academic food supply area?
- IV. What are the issues and trends likely to drive the future supply of food supply veterinarians entering academic careers?
- V. Given the pattern of emerging trends and issues influencing supply and demand, and assuming the absence of any major catastrophic events, what will be the surplus or shortage of academic food supply veterinarians over the next several years?
- VI. Given the answers to the first five questions, how can academic institutions and 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. We next offer general conclusions and recommendations based upon the answers to 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 method<sup>1</sup> 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, 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 efforts. Strategic action taken now by thoughtful leaders can change the pattern of future demand and shortages/surpluses that experts predict will occur if current trends continue and no catastrophic events occur.

Thirteen different sectors of the FSVM profession were identified and the Delphi forecasting process was used to evaluate each. The FSVM sectors evaluated are:

Academe, Dairy, Swine, Poultry, Beef Cattle, Small Ruminants, State/Provincial Public Service, three sectors of US Federal Government Service (Public Health, Animal Health, and Food Safety & Security), Canadian Federal Government Service, Industrial

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<sup>1</sup> For a recent review of the scientific literature on this forecasting technique, see Rowe, G., & Wright, G. (1999). The Delphi Technique as a Forecasting Tool: Issues and Analysis, *International Journal of Forecasting*, 15, 353-375.

Veterinarians in Pharmaceuticals, and Mixed Food Animal Practitioners in Rural Settings. Experts for each sector were identified and their participation solicited. In general, panels of 14-25 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 that experts can change their predictions without any dysfunctional group dynamics that can plague interacting groups. It sets up a learning process where experts have an opportunity to reconsider their judgments in the face of conflicting viewpoints. 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 on issues relevant to demand forecasting. Specifically, we included potential influence items, identified from the FSVM literature, and asked panel members to rate each item's 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 and suggested additional supply related issues. This was designed to help them think about likely future labor supply inflows and prepared them to forecast whether there would be shortages or surpluses of academic 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 influences items where there was 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 were presented with each repeated item. 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 members 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 shortages were added to this survey.

Panel members came primarily from the US, but experts that focused on Canada were also included. Panel members identified whether they had focused on the Canadian or the US context, and additional analysis evaluated whether there seemed to be significant differences between the ratings of the US and Canadian sub-groups. While we see all panel members as having good expertise, we appreciate that some may be more knowledgeable than others. Panel members rated their own forecasting expertise, and additional analyses contrasted those higher than the median “expertise” score with those on the less-expert side of the median. This analysis identified items where there were statistically significant differences between those two sub-groups. Whenever Canadian

versus US and expert versus less-expert differences were found, they were noted in the feedback to the panel. Examples of three of the surveys used for the mixed food animal panel are displayed in Appendix A, B, and C. These three surveys are typical of all the questionnaires used in the demand studies. Additional information at the end of this chapter identifies the temporary website links to each of the surveys for this Delphi panel.

# Issues and Trends Driving Future Demand for Academic Food Supply Veterinarians

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The panel responded to both panel-suggested demand-related items that were unique to this panel, as well as items drawn from the general FSVM literature and discussion with veterinarians. 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 academic sector. Twelve additional items were derived from those open-ended comments for a total of 37 items. In the second survey, the additional 12 items and items where there was fair disagreement within the panel were repeated. Higher agreement on several items was reached in the second survey and only the items with greater disagreement were repeated a final time in the third survey. The following are the survey items seen as *increasing* future demand (starting with the most influential issues and trends first):

## **Trends Increasing Demand**

1. Zoonotic disease-related human health concerns (mean: 6.22 on a 7-point scale)<sup>2</sup>
2. Need for research on food safety concerns (mean: 6.05)
3. Need to address bio-security and agro-terrorism related threats (mean: 6.05)
4. Junior faculty replacing retirees (mean: 6.05)
5. Public concerns over food safety (mean: 6.04)
6. More access to global markets for food exports (mean: 5.90)

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<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. There were not significant differences between the rates of Canada-focused versus US-focused panel members. (p < .10)

7. Need for research on animal production & environmental concerns (mean: 5.71)
8. Public concerns over bio-terrorism (mean: 5.65)  
*Note that the self-rated forecasting experts' sub-group mean of 5.70 was significantly higher than the less-expert sub-group mean of 5.11.*
9. Need to understand animal-human health eco-systems (mean: 5.64)
10. Increasing concerns for animal welfare (mean: 5.62)
11. Demand for diagnostic laboratory services (mean: 5.57)
12. Availability of highly technical or specialized services (mean: 5.48)
13. Growing need to track animals entering the food chain (mean: 5.48)  
*Note that the self-rated forecasting experts' sub-group mean of 5.90 was significantly higher than the less-expert sub-group mean of 4.89.*
14. Increasing concern for animal health (mean: 5.43)
15. Required third-party certification or verification of standards (mean: 5.43)
16. Changing dietary habits in 3<sup>rd</sup> world countries (mean: 5.43)
17. Client use of veterinary herd management services (mean: 5.29)  
*Note that the self-rated forecasting experts' sub-group mean of 5.80 was significantly higher than the less-expert sub-group mean of 5.00.*

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 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. The mean values reported 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 noted below are trends rated as *decreasing* future demand for veterinarians in academic areas starting with the most influential factors first:

### **Trends Decreasing Demand**

1. Loss of resources to other areas in veterinary colleges (mean: 2.53)<sup>3</sup>
2. Faculty positions going to other areas (mean: 2.63)
3. Signal to students that food animal areas are less important (mean: 2.84)
4. Reductions in clinics and food animal cases in hospitals (mean: 2.89)
5. Less student interest in food supply related careers (mean: 2.89)
6. Federal and/or State/Provincial budgetary constraints (mean: 3.11)
7. Curtailment of government support for veterinary services (mean: 3.57)
8. Admission of students without agricultural backgrounds (mean: 3.68)<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, that strategic actions can be taken 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 represent general societal concerns where the cooperation of external entities beyond the

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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. There were not significant differences between the rates of Canada-focused versus US-focused panel members. ( $p < .10$ )

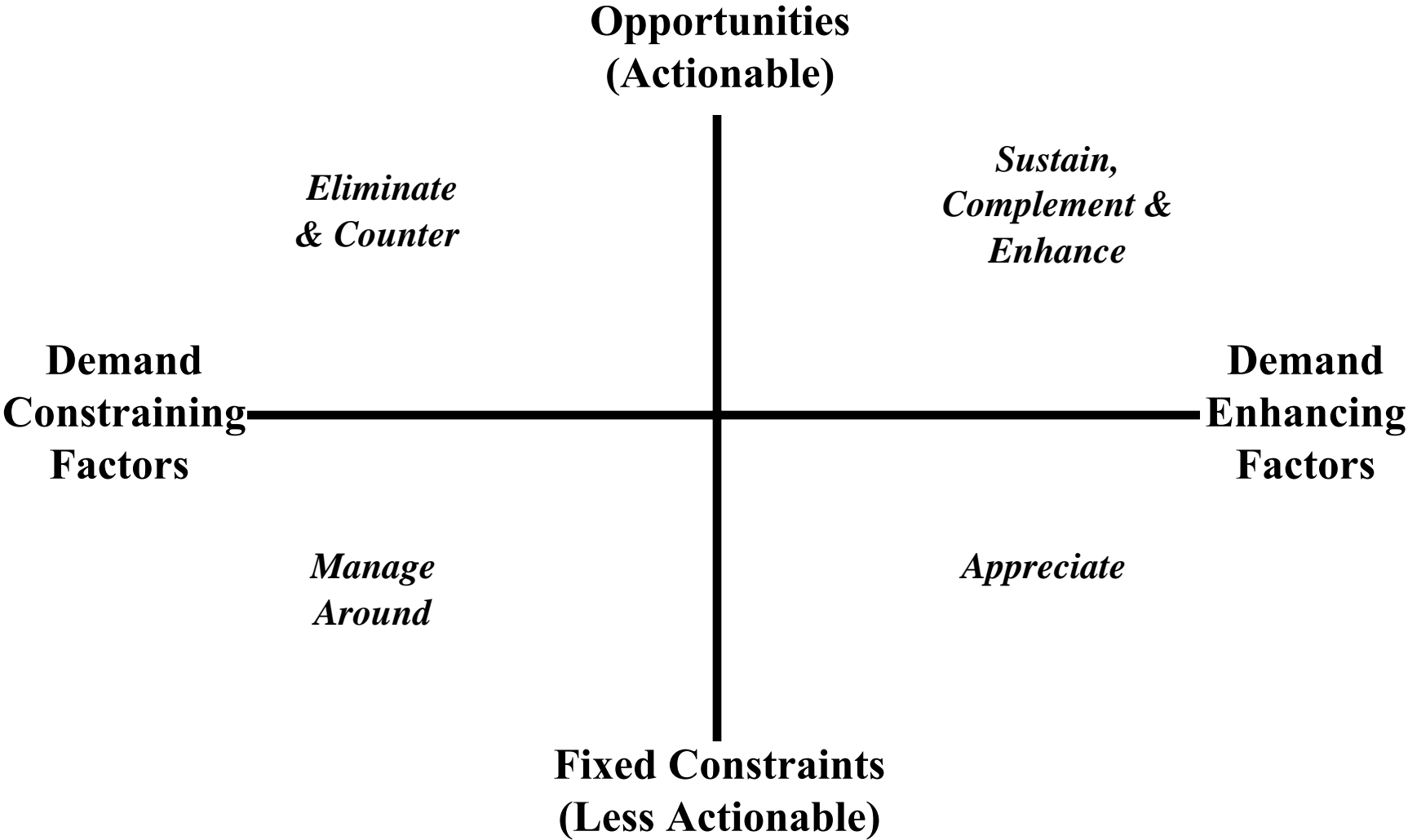
<sup>4</sup> T-test analysis between panelists focused on the Canadian setting and those addressing the US context did not find any pattern of differences in the views of those two subgroups. ( $p < .10$ )

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 pattern of results and guiding future strategic action. As noted in that figure, the best targets for strategic action are on the “actionable” or top-half of the figure. In order to increase future demand, actionable demand-constraining factors (on the top left-hand side of the figure) must be lessened or countered. The top, right-side quadrant represents actionable demand-enhancing trends that can be sustained, complemented, or enhanced in some way. The lower quadrants represent less-manageable trends and factors. Any strategic responses to the challenges uncovered by this research need to be mindful of these constraints.

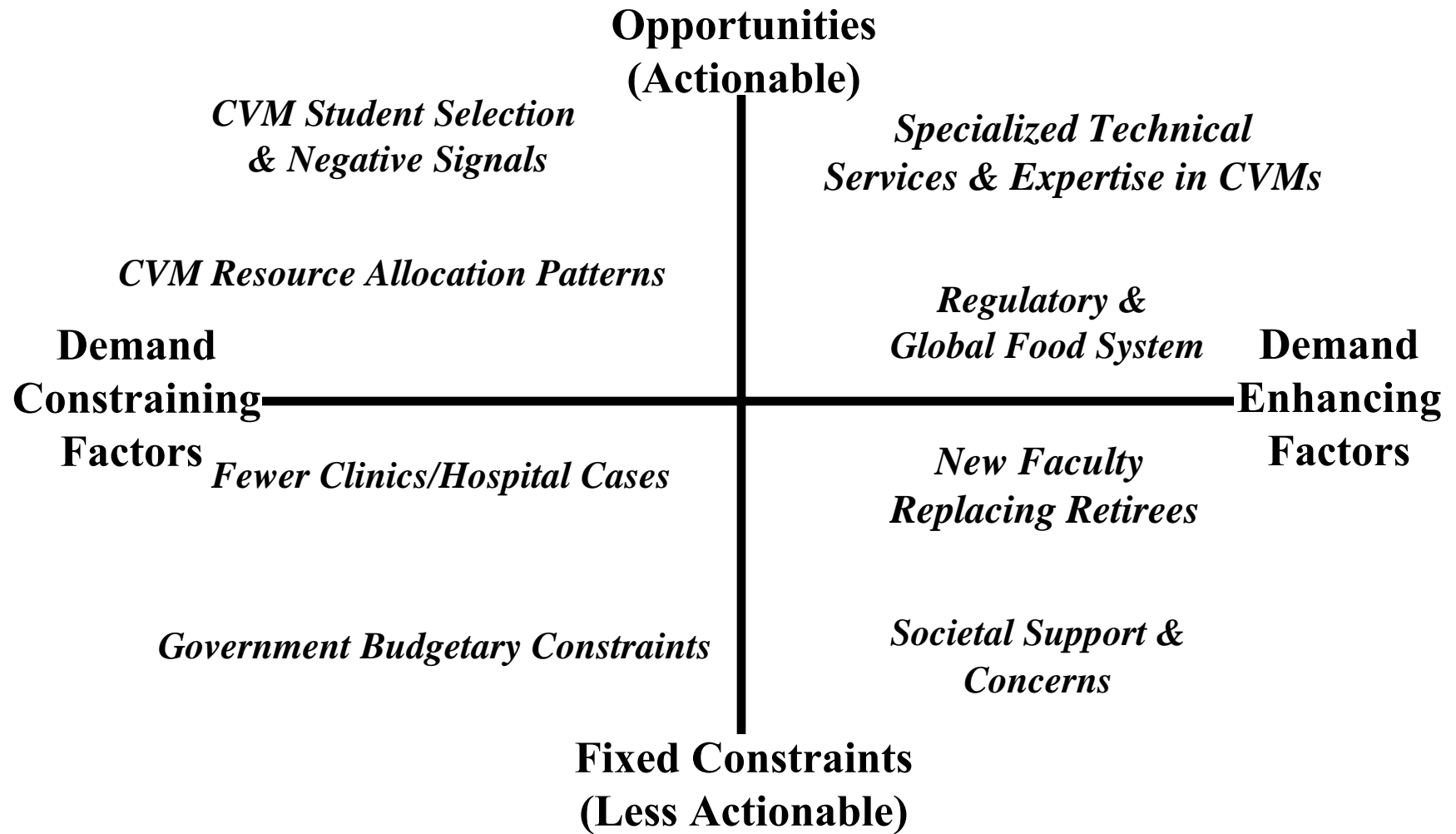
This planning matrix can be used to organize the results of the analysis of the demand related issues and trends. The eight demand-decreasing items above can be mapped to the left-side of Figure 1. Figure 2 captures the themes evident in the results. For example, items 1 (loss of resources to other areas) and 2 (positions going to other areas) reflect a pattern of continuing resource allocation decisions made by Colleges of Veterinary Medicine (CVMs) that constrain demand. These trends comprise a *CVM Resource Allocation Decisions* theme noted in the upper-left quadrant of Figure 2. This issue is very actionable in the sense that it can be changed with concerted action without the extensive cooperation of external parties. Items 3 (negative signals to students), 5 (less student interest), and 8 (admission of students without agricultural backgrounds) are related to the resource allocation process. This is noted as the *CVM Student Selection & Negative Signals* theme noted in the same upper-left quadrant. Changes in admissions

# Figure 1 Planning Matrix



# Figure 2

## Demand Diminishing & Enhancing Issues in the Academic Sector



criteria and signals sent to students (in part because of CVM resource allocation decisions) can be orchestrated to change the currently expected pattern of “less student interest in food supply related careers” (item 5). Items 6 (budgetary constraints) and 7 (curtailment of government support) both refer to the future demand-diminishing influence of less available governmental support. This is noted as *Government Budgetary Constraints* in Figure 2. While perhaps even a small change in this area could have an important positive influence, it is also reasonable to conclude that this constraint is logically less changeable than the others noted above and should be placed in the lower-left quadrant. Item 4 (reductions in clinics and hospital cases) seems somewhere in between and is noted as *Fewer Clinics/Hospital Cases* on Figure 2. They are held in place by both managerial choices within CVMs and larger external factors such as the proximity of food animals to hospitals and the presence of competing entities, such as private clinics. This theme was placed near the line but in the lower-left quadrant in recognition of those external factors.

Listing of the 17 demand-increasing items summarized above as “Trends Increasing Demand” all map to the right-side of the planning matrix. Many relate to larger societal and bio-security concerns. Zoonotic disease-related human health (item 1), food safety research needs (item 2), and bio-security/agro-terrorism (item 3) concerns are the top rated demand increasing factors. These are closely related to several other demand increasing related issues and trends, e.g., items 5 (food safety), 8 (bio-terrorism), 10 (animal welfare), and 14 (animal health). These items have long been demand factors for the profession, but have become larger issues in the public eye in recent years. These are not factors that are easily changed by strategic actions in the profession, but should be appreciated in the strategic planning process. The *Societal Support & Concerns* theme is

noted in the lower-left quadrant of the Figure 2 planning matrix. Item 4 relates to the opportunities created for junior faculty when retirees depart. Since retirements are a function of the age and demographic factors, these are not highly controllable and the *New Faculty Replacing Retirees* theme is noted in the lower-right quadrant.

Items 7 (animal production & environmental concerns), 9 (animal-human ecosystems), 11 (diagnostic services), 12 (technical & specialized services), and 17 (herd management services) are quite different in that they are more actionable. Strategic actions could be used to advertise and improve the demand-enhancing influences unique to expertise within Colleges of Veterinary Medicine. Consequently, the theme related to these items, *Specialized Technical Services & Expertise in CVMs* is placed in the upper-right quadrant of Figure 2.

*Regulation & Global Food System Opportunities* is a theme that focuses on trends outside the direct control of the profession, but responses to these issues can be managed and improved with strategic action. Items 6 (access to global markets), 13 (animal tracking), and 15 (3<sup>rd</sup> party certifications) are all related to this theme. It has been placed near the line in the upper-right quadrant to indicate the partly constrained and partly actionable nature of this theme.

## The Future Demand for Academic Food Supply Veterinarians

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The Delphi process gave panel members an opportunity to make initial estimates of future demand over several time periods in the first survey. The second 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 feedback report on the second survey results was additional opportunities to reconsider and make final projections of future demand. As is often the case with Delphi panels, the range of estimates from the first survey was quite wide and then narrowed with each successive survey.

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 (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 estimate at the 50<sup>th</sup> percentile) of the distribution of estimates. The pattern of estimates generally followed the usual Delphi outcome of broader ranged early round estimates, indicating plenty of disagreement, followed by a narrowing of estimates (or more agreement) in later survey rounds. Figures 3 through 5 provide the results of each time period. Figure 6 provides a summary of the results of the final survey for all three time periods.

There is a general consensus that demand is increasing. The middle 50% of the panel projected demand increases over all three time periods in the final survey. The point estimates seen in the means and median scores varied between +3% and +6%. While there was general agreement that demand will increase, there remained after the final Delphi round, some disagreement on the exact extent that demand is expected to increase. There was understandably a wider range of projections for the longer-term forecast. Further analysis was done to evaluate the basis for these differing perceptions within the panel.

Analysis contrasting the demand forecasts of Canada-focused panelists versus US-focused members found that while the US-focused forecasts were around half to one point higher than the Canada-focused means, these differences did not reach statistical significance. Had only the US-focused members been used for the statistics reported in Figures 3 to 6 then the mean numbers would have been 1.8 higher for the short-term forecast, .8 higher for the medium-term forecast, and .4 higher for the long-term forecast. Sub-group analysis based on self-rated forecasting expertise found that while experts always forecasted higher demand than the less-expert sub-group, these differences also did not reach statistical significance.

# Figure 3

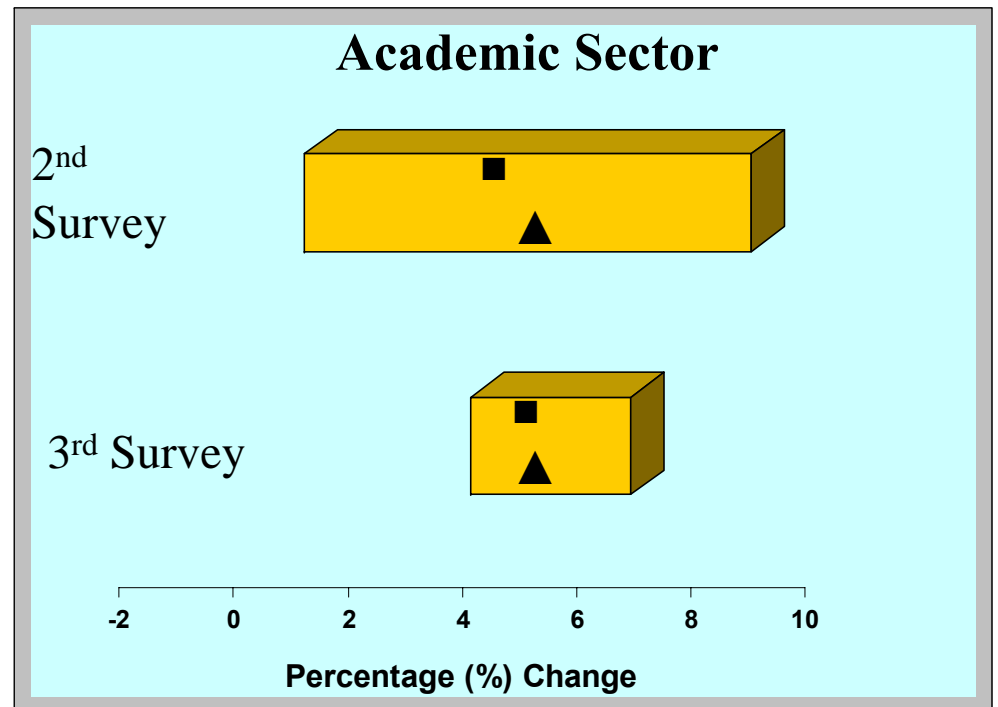
## Short-Term Demand Change (2004-07)

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

- Mid-50% = +1.0% to +9.0%
- Mean = +4.1% (■)
- Median = +5.0% (▲)

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

- Mid-50% = +4.0% to +7.0%
- Mean = +4.8% (■)
- Median = +5.0 (▲)



# Figure 4

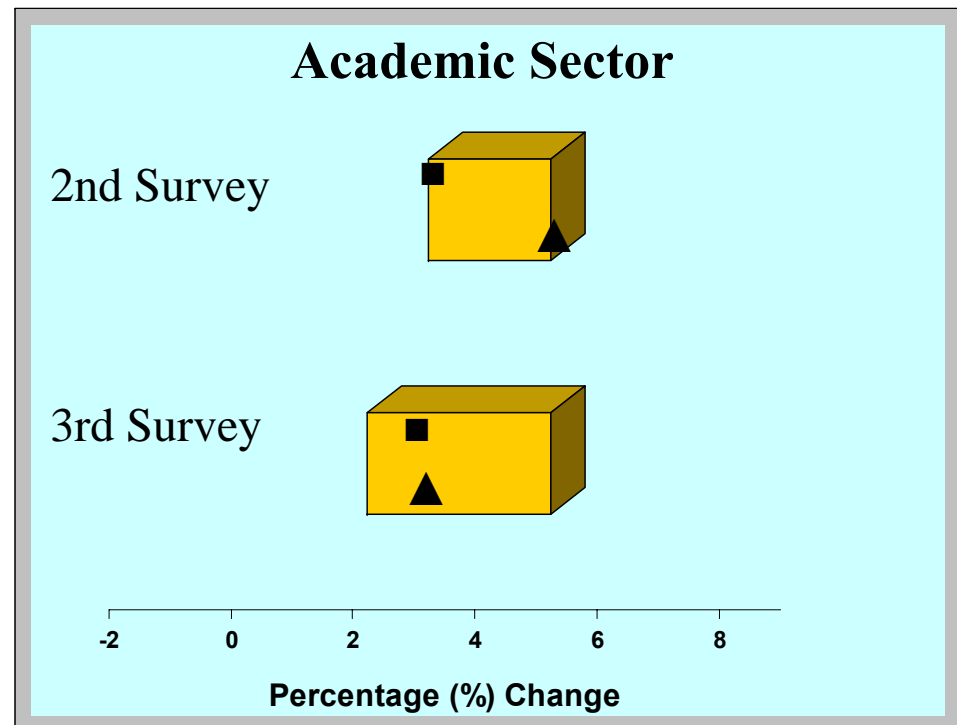
## Medium-Term Demand Change (2007-10)

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

- Mid-50%: +3.0% to +5.0%
- Mean = +2.9% (■)
- Median = +5.0% (▲)

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

- Mid-50%: +2.0% to +5.0%
- Mean = +3.0% (■)
- Median = +3.0% (▲)



# Figure 5

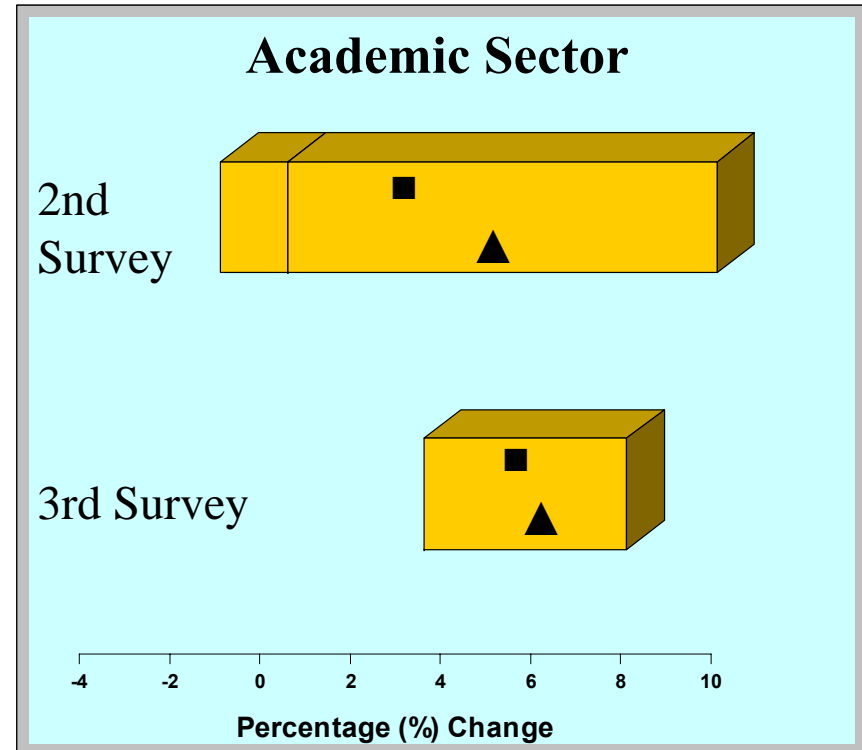
## Long-Term Demand Change (2010-16)

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

- Mid-50%: -1.5% to +10.0%
- Mean = +2.9% (■)
- Median = +5.0% (▲)

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

- Mid-50%: +3.5% to +8.3%
- Mean = +5.2 % (■)
- Median = +6.0 % (▲)



# Figure 6

## Future Demand Summary

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

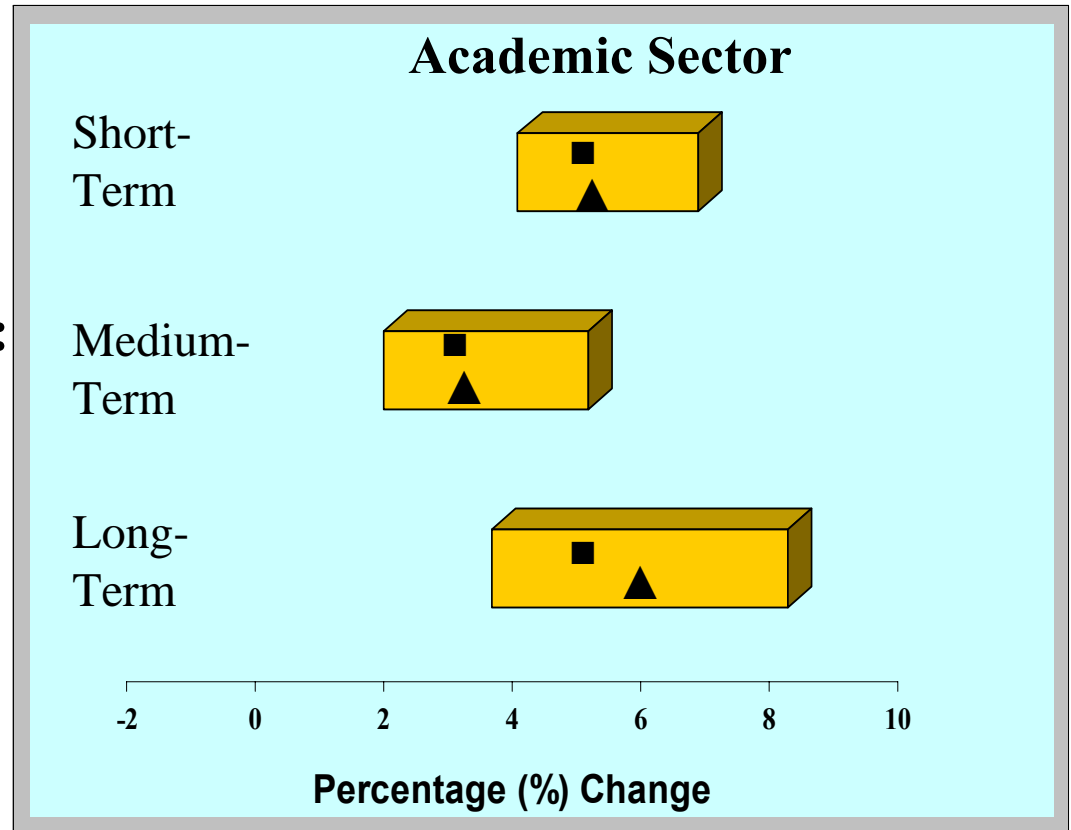
- Mid-50% = +4.0% to +7.0%
- Mean = +4.8% (■)
- Median = +5.0 (▲)

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

- Mid-50%: +2.0% to +5.0%
- Mean = +3.0% (■)
- Median = +3.0% (▲)

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

- Mid-50%: +3.5% to +8.3%
- Mean = +5.2 % (■)
- Median = +6.0 % (▲)



## Growing or Declining Demand

To better understand the spread of demand forecasts, analysis was done that compared the perceptions of those rating demand increases at or above the group median score versus those projecting lower increases in demand. Several significant differences in their ratings of the demand-influencing factors presented above were found. The following factors are seen by those projecting higher (versus lower) future demand as having significantly *higher* influence on demand:<sup>5</sup>

- Public concerns over food safety (mean is 6.5 in the high demand sub-group vs. 5.8 in the low demand sub-group)
- Zoonotic disease-related human health concerns (6.4 in the high sub-group vs. 5.8 in the low sub-group)

Those seeing stronger increasing future demand (compared to those seeing lower increasing demand) also rated the following factors significantly *lower*. This means that these items are seen as having a *stronger* influence on decreases in demand:

- Signals to students that the food animal area is less important (2.4 in the high sub-group vs. 4.1 in the low sub-group)
- Less student interest in food supply related careers (2.6 in the high sub-group vs. 3.9 in the low sub-group)
- Faculty positions going to other areas (2.4 in the high sub-group vs. 3.6 in the low sub-group)

The first two items (food safety and zoonotic disease-related health issues) provide the most direct explanation for the differences in demand forecasts within the panel. The last three, while suggested by panel members as demand-related and included as such in the second survey, logically have a more direct relationship to the supply of veterinarians entering into academic positions.

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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.

## 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. These suggestions were content analyzed and 15 areas received multiple mentions. These were used to form items which panel members rated in the second survey. The *higher-demand* activity areas (starting with the highest rated areas) are:

1. Public health related roles (mean: 6.19 on a 7-point scale)<sup>6</sup>
2. Food quality & safety tasks (mean: 6.05)  
*Note that Canada-focused panel members' mean of 6.50 is significantly higher than the US-focused sub-group mean of 5.86.*
3. Applications of quantitative analysis & information management skills (mean: 6.05)
4. Bio-security related activities (mean: 6.05)  
*Note that the self-rated forecasting experts' sub-group mean of 6.40 was significantly higher than the less-expert sub-group mean of 5.78.*
5. Diagnostic laboratory activities (mean: 5.71)  
*Note that Canada-focused panel members' mean of 6.33 is significantly higher than the US-focused sub-group mean of 5.43.*
6. Application of high-level species-specific expertise (mean: 5.71)
7. Agri-business & management skill training activities (mean: 5.62)
8. Economic analysis & assessment activities (mean: 5.48)
9. Disease investigation & diagnoses tasks (mean: 5.29)
10. Field & producer out-reach (extension) roles (mean: 5.00)
11. Reproductive medicine for herds (mean: 4.48)

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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.

The other activity areas are seen as facing relatively lower demand in the future. These *lower-demand* areas are:

1. Hospital-based food animal treatment (mean: 2.76)<sup>7</sup>
2. Ambulatory services for individual animals (mean: 2.95)
3. Reproductive medicine for individual animals (mean: 3.00)
4. Food animal surgeries (mean: 3.10)

Figure 2 noted two actionable demand-enhancing strengths that academic food supply veterinarians enjoy. They are the *Specialized Technical Services & Expertise in CVMs* and *Regulatory & Global Food System* factors. The 11 activity areas noted above are related to both of these. Some of them are more relevant to herd health expertise. In contrast, the four areas rated as likely to be in lower demand tend to focus on individual animal treatment activities and are logically related the demand-decreasing theme of *Fewer Clinics/Hospital Cases* noted in the lower-left quadrant of Figure 2.

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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, 2. Decrease, 1. Strong Decrease.

# Trends and Issues Driving the Future Supply of Academic Food Supply 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 in this study. Seven additional supply-related influence items were drawn from open-ended comments to the first survey and included in the second survey. Items from the initial set of 17 items were also included in the second survey where 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 a given item is used in the summary below. The following are the highest-rated trends or issues *increasing* the future supply of veterinarians entering academic food supply careers:

## Trends Increasing Supply

1. Targeted scholarship programs for FSVM-tracked students (mean: 5.57 on a 7-point scale)<sup>8</sup>  
*Note that the self-rated forecasting experts' sub-group mean of 5.80 was significantly higher than the less-expert sub-group mean of 5.11.*
2. Initiatives targeting recruitment and selection of FSVM-oriented students into Colleges of Veterinary Medicine (mean: 5.29)  
*Note that the self-rated forecasting experts' sub-group mean of 5.50 was significantly higher than the less-expert sub-group mean of 4.89.*
3. Initiatives promoting FSVM career interests to younger students (mean: 5.16)
4. Promoting public awareness of the FSVM profession's societal contributions (mean: 5.10)  
*Note that the self-rated forecasting experts' sub-group mean of 5.30 was significantly higher than the less-expert sub-group mean of 4.78.*

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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 academic food supply 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.

5. Expected high number of food supply veterinarians retiring in the near future (mean: 4.81)

The panel rated several trends and factors that are leading to a *decrease* in the future supply of food supply veterinarians entering into academic careers. These are presented starting with the most extreme supply-decreasing factors:

### **Trends Decreasing Supply**

1. Less emphasis on food animal practice in veterinary colleges (mean: 2.57)<sup>9</sup>
2. Continued selection processes that favor non-FSVM oriented students (mean: 2.63)
3. Little exposure to food supply career options in college (mean: 2.71)
4. Perceived lack of demand for food animal skills (mean: 2.76)
5. High debt load of veterinary school graduates (mean: 2.84)  
*Note that the self-rated forecasting experts' sub-group mean of 3.30 was significantly higher than the less-expert sub-group mean of 2.33.*
6. Lack of positive role models in veterinary food supply practice (mean: 2.89)
7. Lack of spousal career options in rural areas (mean: 2.90)
8. More women veterinarians entering the workforce (mean: 2.91)
9. Rewards provided relative to faculty in other areas and private practice options (2.95)
10. Federal and/or State/Provincial budgetary constraints (mean: 2.95)
11. Physical demands of large animal veterinary work (mean: 2.95)
12. Limited lifestyle and career opportunities in rural areas (mean: 3.05)
13. Fewer applicants with rural or agricultural background (mean: 3.05)

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<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 academic food supply veterinarians. The mean rating for each item is noted in parentheses. The following scale anchor points will help in the interpretation of those means: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence.

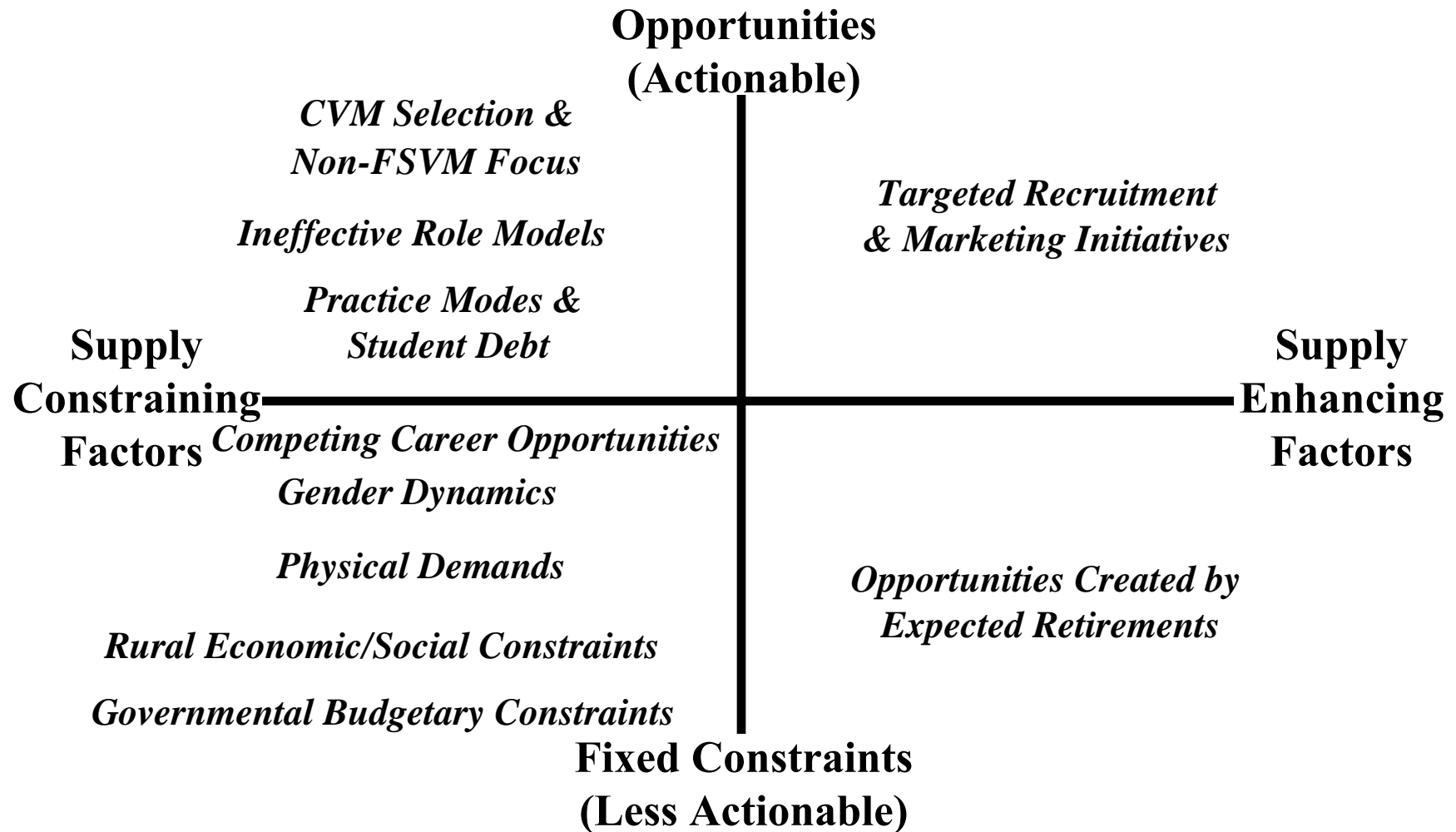
14. Need to work long hours and emergency calls (mean: 3.16)

15. Lack of food supply practice-related externships for students (mean: 3.19)

These supply-related factors can also be organized into the planning matrix introduced earlier. Figure 7 captures the general themes seen in the two listing of trends increasing and decreasing supply. The list of 15 Trends Decreasing Supply all map to the left-side of that figure. The more extreme impediments to the future supply, such as items 1 (less emphasis on food animal practice), 2 (selection of non-FSVM oriented students), 3 (little exposure to food supply career options), and 4 (low demand for food animal skills), as well as items 13 (fewer applicants with agricultural background) and 15 (lack of food supply externships), all relate to how Colleges of Veterinary Medicine select and educate, and then send signals to students about food supply career options. This is noted as the *CVM Selection & Non-FSVM Focus* theme in the upper-left quadrant in Figure 7. Item 6 relates to the view that *Ineffective Role Models* are not attracting students to the profession or providing career support for new DVM graduates. Items 14 (emergency calls) reflects the current way of organizing veterinary practices. There are alternative models of practice that can be used to mitigate this challenge. Similarly while educating veterinarians will continue to be expensive, there are alternatives that may lessen the negative influence of student debt (item 5). Even though constraints in the nature of work and cost of education exist, this *Practice Modes & Student Debt* theme is seen as partly actionable. For this reason it is placed near the middle line in the upper-left quadrant of Figure 7.

# Figure 7

## Supply Diminishing & Enhancing Issues in the Academic Sector



A number of the items constraining supply reflect larger societal and economic trends and, as such, are less actionable. They need to be understood and managed around. For example, items 7 (spousal career opportunities), 8 (more women), and 12 (career opportunities in rural areas) reflect a larger pattern of urbanization and the increasing number of females being attracted to veterinary careers. These map to the lower-left quadrant in that they are social patterns that have their basis in larger societal forces and are referred to as *Gender Dynamics* and *Rural Economic/Social Constraints*. Item 11 (*Physical Demands*) is an area that is not easily changeable. Food animals are often large and physically demanding. Similarly, item 9 relates to larger economic opportunities that academic veterinarians face. This is noted as *Competing Career Opportunities* in Figure 7. The simple solution of raising faculty salaries is constrained by larger economic challenges that universities face. This is placed near the middle line to note that, in spite of larger economic forces at work, there are ways to structure and make academic DVM careers more attractive. *Governmental Budgetary Constraints* (item 10) is perhaps one of the more fixed constraints noted in the lower-left quadrant.

The five Trends Increasing Demand introduced on the first page of this section represent opportunities for promoting the profession and building on the good reputation food supply veterinarians enjoy in society. Items 1 (targeted scholarships), 2 (targeted recruitment), 3 (career promotions to younger students), and 4 (promoting the profession's societal contributions) all relate to initiatives that promote food supply careers. These map to the upper-right quadrant and are noted as *Targeted Recruitment & Marketing Initiatives*. These can be continued and extended to attract more high quality students to the FSVM profession.

Item 5 relates to the high number of retirements expected in the near future. This was rated as a factor that will increase the number of new veterinarians *entering* into the profession. The retirement rate is largely age-based and (even with early retirement programs) is not highly actionable. This *Opportunities Created by Expected Retirements* theme is placed in the lower-right quadrant for this reason. An important related, but unrated, issue is the influence that the expected retirement bulge may have on the *aggregate* supply of food supply veterinarians. If these retirees are not replaced with food supply veterinarians, the aggregate supply will go down even though there are more opportunities for new faculty hires.

## The Future Shortages of Academic Food Supply 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 considering the views of other panel members.

Estimates of shortages were grouped into the same three time periods used to forecast future demand: 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 over each time period. As was the case with demand estimates, both the range (i.e., the middle 50% of replies) 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 time period. Figure 11 provides the summary of the results from the final survey for all three periods.

# Figure 8

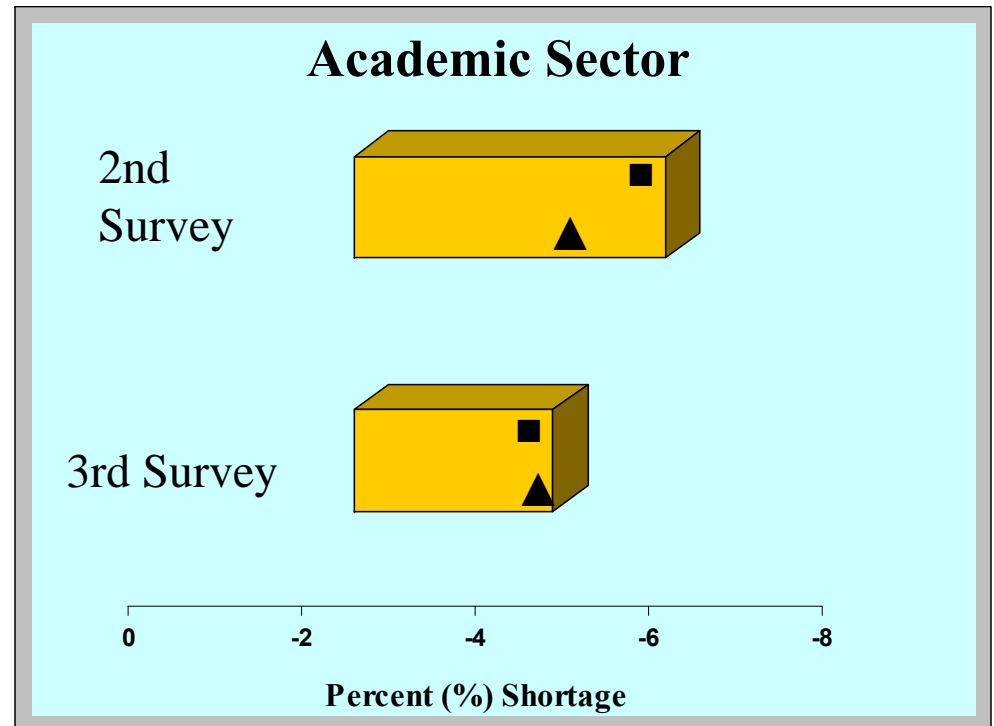
## Short-Term Shortages (2004-07)

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

- Mid-50% = -2.5% to -6.4%
- Mean = -6.1% (■)
- Median = -5.0% (▲)

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

- Mid-50% = -2.5% to -5.0%
- Mean = -4.9%(■)
- Median = -5.0 (▲)



# Figure 9

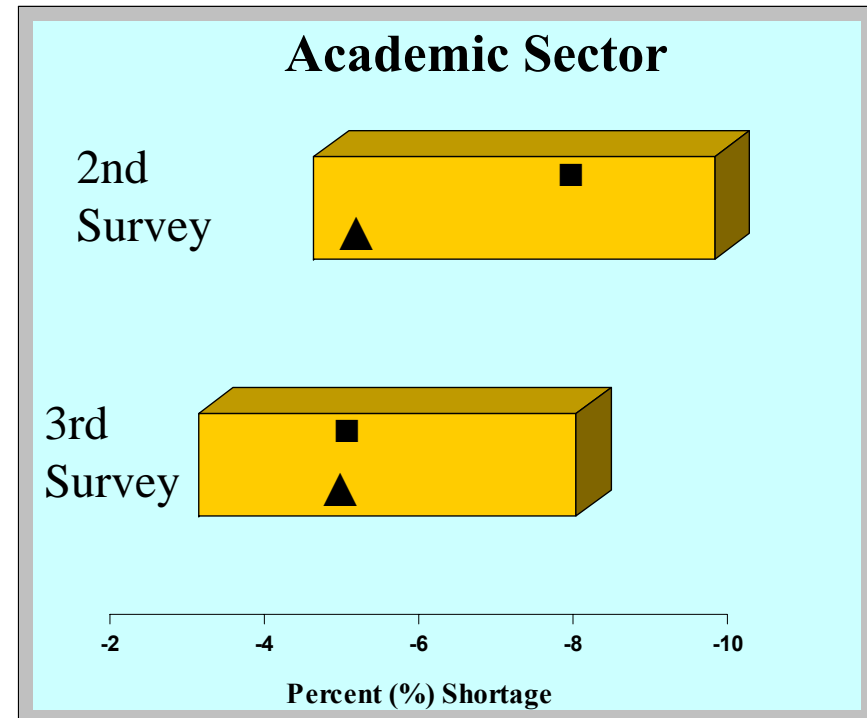
## Medium-Term Shortages (2007-10)

### 2nd Survey Results:

- Mid-50% = - 4.5% to -10%
- Mean = -8.0% (■)
- Median = -5.0% (▲)

### 3rd Survey Results:

- Mid-50% = -3.0% to -8.0%
- Mean = -5.6%(■)
- Median = -5.0 (▲)



# Figure 10

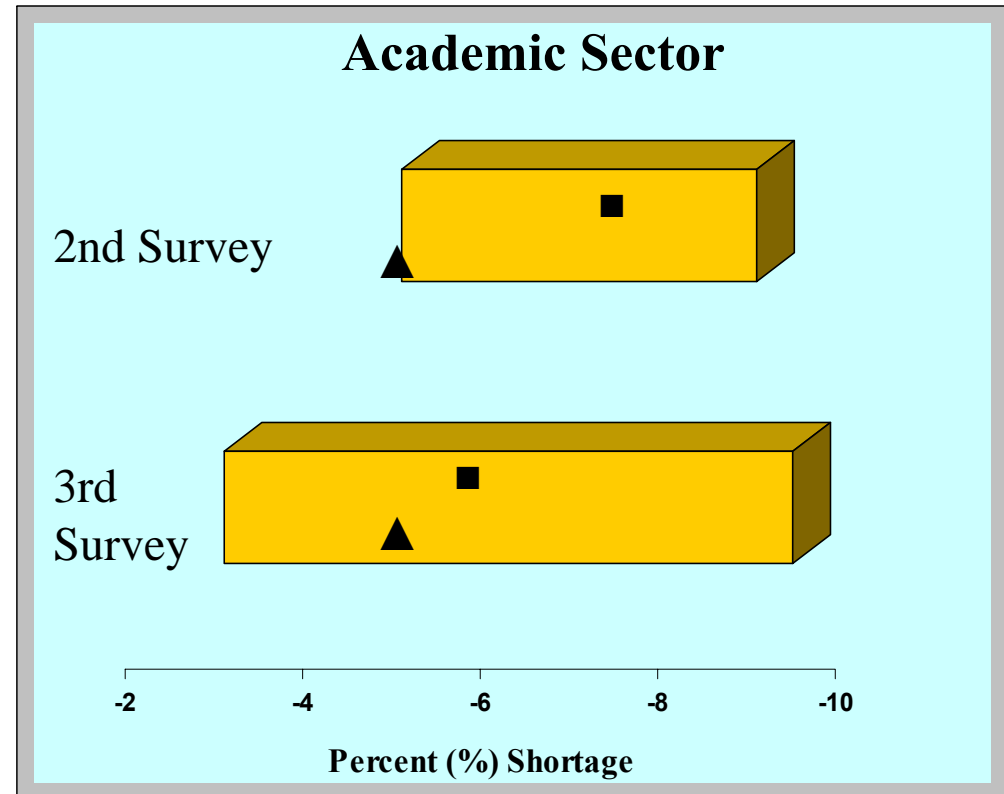
## Long-Term Shortages (20010-16)

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

- Mid-50%: -5.0% to -9.0%
- Mean = -7.4% (■)
- Median = -5.0% (▲)

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

- Mid-50%: -3.0% to -9.5%
- Mean = -5.9 % (■)
- Median = -5.0 % (▲)



# Figure 11

## Future Shortages Summary

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

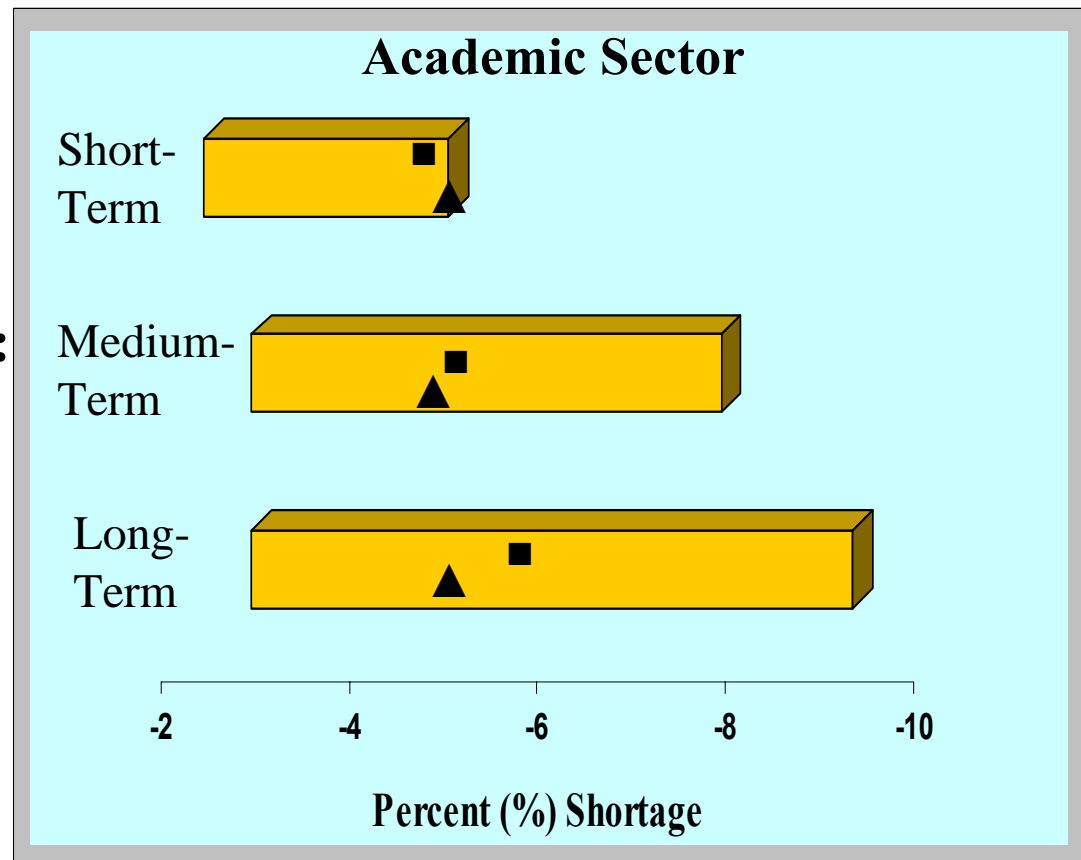
- Mid-50% = -2.5% to -5.0%
- Mean = -4.9% (■)
- Median = -5.0 (▲)

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

- Mid-50%: -3.0% to -8.0%
- Mean = -5.6% (■)
- Median = -5.0% (▲)

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

- Mid-50%: -3.0% to -9.5%
- Mean = -5.9% (■)
- Median = -5.0% (▲)



The panel reached agreement that, given current trends, there will be a shortage of academic food supply veterinarians over the next several years. The point estimates for all three time periods were in the 5% to 6% shortage range. The middle 50% (between the 25<sup>th</sup> and 75<sup>th</sup> percentile of the distribution) identified a fairly narrow range of -2.5% to -5.0 for the final short-term estimate (2004-07), indicating fair agreement. The range widened for later time periods indicating more uncertainty about how current trends will play out over a longer time period. Analysis of Canada- and US-focused panel members indicated that while the US-focused mean was between one to one and one-half points higher, these differences did not reach statistical significance. Had only the US-focused numbers been used in calculating the means in Figures 8 through 11, they would have been approximately +.5% higher.

Sub-group analysis based on self-rated forecasting expertise found statistically significant ( $p < .10$ ) differences between more- versus less-confident forecasters. These are the results from the final survey:

- Short-Term (2004-2007) Shortages: Mean of -6.45% average shortage for the expert sub-group versus -3.00% for the less-expert sub-group
- Medium-Term (2007-10) Shortages: Mean of -7.80% average shortage for the expert sub-group versus -3.22% for the less-expert sub-group
- Long-Term (2010-16) Shortages: Mean of -7.65% average shortage for the expert sub-group versus -4.00% for the less-expert sub-group

These differences are quite dramatic and go a long way to explain the spread of opinion in the panel. Had only the “more-expert” views been used, the means presented on Figures 8 through 11 would be between one and one-half to over two points higher, indicating deeper shortages.

Additional analysis was conducted to further explore the range of shortage forecasts within the panel. These analyses were used to determine the factors that differentiated those making more conservative estimates versus those projecting more extreme shortages. A median split, based on the median shortage estimated over all time periods was used to place panelists into “limited-shortages” and “deeper-shortages” sub-groups. That analysis indicates that those seeing deeper future shortages differ from the more conservative panelists in that they see *more extreme supply-constraint problems* associated with:

- Lack of food supply practice-related externships for students (mean: 2.22 on a 7-point scale vs. 3.78 in the limited-shortages sub-group)<sup>10</sup>
- Limited lifestyle and career opportunities in rural areas (mean: 2.63 vs. 3.56 in the limited-shortages sub-group)
- Fewer applicants with rural or agricultural backgrounds (mean: 2.70 vs. 3.44 in the limited-shortages sub-group)

Those seeing deeper shortages also see the following *demand-increasing factors* as having a significantly *higher* influence on demand increases:

- Growing need to track animals entering the food chain (mean: 5.80 on a 7-point scale vs. 4.78 in the limited-shortages sub-group)<sup>11</sup>
- More access to global markets for food exports (mean: 5.60 versus 5.00 in the limited-shortages sub-group)
- Public concerns over bio-terrorism (mean: 5.70 versus 5.11 in the limited-shortages sub-group)

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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 academic food supply veterinarians. The mean rating in 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: 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 academic food supply 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.

The sub-group forecasting more extreme shortages is *both* more optimistic about how key demand-increasing influences of how the *Regulatory & Global Food System* theme and bio-terrorism threats will enhance future demand *and* more pessimistic about the extent that the *CVM Selection & Non-FSVM Focus* theme (also noted in Figure 7) will constrain the future entry of food supply veterinarians into academic careers.

# Solutions for the Future Shortage of Academic Food

## Supply 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 academic veterinarians? Eighteen different potential solutions were developed and evaluated by all 13 panels. The panel 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 7 on the 7-point rating scale indicates that a solution would be “highly effective” at eliminating the expected shortage. The mean provides the arithmetic average of all rating. The following are the solutions that are (with the exception of items 14 and 15) rated above the mid-point of the scale. These are listed in order of rated effectiveness in eliminating shortages:

1. Expanded postgraduate fellowships in food supply areas (5.89 mean on a 7-point scale)<sup>12</sup>
2. Student debt repayment and scholarship programs for service in areas of need (mean: 5.63)  
*Note that the self-rated forecasting experts’ sub-group mean of 6.00 was significantly higher than the less-expert sub-group mean of 5.22.*
3. Mentoring initiatives for students and those stating a food supply career (mean: 5.26)  
*Note that the self-rated forecasting experts’ sub-group mean of 6.10 was significantly higher than the less-expert sub-group mean of 4.33.*
4. Focused recruitment of high school and college students with food supply interests into veterinary colleges (mean: 4.84)

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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 DVMs in academic settings. The following scale should be used in interpreting the mean rating and middle 50% range noted for each possible solution: 1. Not at all Effective, 3. Slightly Effective, 5. Effective, 7. Highly Effective.

- Note that the self-rated forecasting experts' sub-group mean of 5.50 was significantly higher than the less-expert sub-group mean of 4.11.*
5. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities (mean: 4.74)
  6. Appointment of more food supply faculty at Colleges of Veterinary Medicine (mean: 4.74)  
*Note that the self-rated forecasting experts' sub-group mean of 5.40 was significantly higher than the less-expert sub-group mean of 4.00.*
  7. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities (mean: 4.63)
  8. Increased focus of food supply coverage early in the DVM curriculum (mean: 4.63)
  9. Expand the Centers of Excellence concept with a nationally recognized focus on different food supply sectors (mean: 4.58)  
*Note that the self-rated forecasting experts' sub-group mean of 5.50 was significantly higher than the less-expert sub-group mean of 3.56.*
  10. Expand paid work-study programs during the final year of the DVM program (mean: 4.37)
  11. Paid externship requirement in food supply medicine during the summer (mean: 4.21)
  12. Reserve class slots for academically qualified students with food supply interests and relevant background (mean: 4.11)  
*Note that the self-rated forecasting experts' sub-group mean of 4.78 was significantly higher than the less-expert sub-group mean of 3.44.*
  13. More involvement of food supply practitioners in training veterinary students (mean: 4.11)
  14. Focused recruitment of women students in food supply areas (mean: 3.84)  
*Note that Canada-focused panel members' mean of 2.67 is significantly lower than the US-focused sub-group mean of 4.38. Also, note that the self-rated forecasting experts' sub-group mean of 4.50 was significantly higher than the less-expert sub-group mean of 3.11.*
  15. Development and dissemination of Business Best Practices guidance for food supply veterinary enterprises (mean: 3.79)  
*Note that the self-rated forecasting experts' sub-group mean of 4.80 was significantly higher than the less-expert sub-group mean of 3.67.*

These actions represent possible tactics that can be integrated into a larger strategy for dealing with future shortages. Several tactics related to enhancing the interest of pre-veterinary students. For example, items 2 (debt repayment/scholarships), 4 (focused recruitment), 5 (marketing campaigns), and 12 (reserve class slots) should have the effect of increasing the supply of students who are interested in food supply careers applying to veterinary colleges. Many items focus on changing the experience that veterinary students will have over their DVM experience. The appointment of more food supply faculty (item 6) will facilitate students getting more early exposure to food supply careers (item 8). Using more practitioners (item 13) represents an additional resources for educating students. Items 1 (postgraduate fellowships), 3 (mentoring initiatives), 10 (paid work-study programs), and 11 (paid externship requirement) are strategies for giving those pursuing a food supply track a more hands-on educational experience and career support in pursuing a food supply path. Finally, items 7 (Reserve Corps) and 9 (Centers of Excellence) represent large-scale, governmental initiatives that will address both larger societal needs and deliver more resources that will help educate and employ food supply veterinarians.

## Conclusion: A Need for Action

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This study finds 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 the veterinary profession to address 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 to society!

Shortages of academic food supply veterinarians are particularly dangerous in that they will contribute to shortages in other FSVM sectors. Vacant academic positions will directly lead to fewer food supply students being attracted, retained, and graduated into vacant FSVM positions in other sectors. Such shortages will affect how well other sectors will be able to address animal health and related human health consequences, food safety and security, and increasingly important bio-security and agro-terrorism protections. Producing more food supply veterinarians in sectors where significant shortages exist starts with students in Colleges of Veterinary Medicine. If there are inadequate numbers of academic FSVM professionals, then any corrective measures to lessen shortages in others sectors will fall short. If this scenario is allowed to play out, the FSVM sectors facing shortages will simply be left to compete with each other in a zero-sum game where there is a loser for each winner. No sector can really win this battle. Public health, the safety of the food supply system, and our national economic well-being will end up being the unequivocal loser.

The pattern of results also underscore that the future we will live in tomorrow is created by the collective actions we take today. While there are larger trends (such as urbanization) that will not be changed and must be adjusted to and managed around, the

future is not simply 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 within the profession. These choices can be thoughtfully reviewed and revised.

Strategic actions implemented in the near-term can change the trends that will otherwise continue to shape a future that is not good for academic food supply veterinarians or society. We should expect that unplanned or localized responses to shortages will add up to a sub-optimal solution. Unnecessary negative economic impacts and challenges to societal well-being is the natural consequence to such non-strategic responses. The veterinary profession can do better! Fulfilling its Oath and responsibilities to society requires immediate strategic action to counter these trends.

The shortages forecasted for academic food supply veterinarians are conservative. The estimates 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 to counter such events.

The planning matrix and supporting 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 also address where its *strengths* and *weaknesses* are located to move beyond this starting point. Thoughtful leaders in the larger profession need to identify where they have the best advantage to guide effective collective action. All professions have strengths and weaknesses; effective leaders understand how to leverage their strengths while being mindful of their weaknesses. The solutions identified in the previous section provide a starting point for developing

effective elements of an effective coherent strategy of collective action. This will change the profession and enable it to better fill its obligations to society.

## Supplemental Information

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

1. Temporary links to the three the academic panel 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 general design of all second- and third-round surveys are similar. Try these web-links to view a copy of the three surveys completed by the academic panel:
  - a. First Survey: <http://survey.cba.ksu.edu/prince/academic1/index.htm>
  - b. Second Survey: <http://survey.cba.ksu.edu/prince/academic2/index.htm>
  - c. Third Survey: <http://survey.cba.ksu.edu/prince/academic3/index.htm>
2. Exhibit A provides a listing of all members who originally agreed to participate in the Academic Delphi panel.
3. Exhibits B and C provides copies of the interim feedback reports that accompanied the second and third surveys. The first report (Exhibit B) summarized trends found in the first survey data and provides guidance for interpreting the feedback incorporated into the second survey. The second report (Exhibit C) served 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 academic Delphi panel.

Exhibit A

Original Academic Delphi Panel  
Members<sup>13</sup>

1. Alex Ardens
2. Daryl Buss
3. Robert Carson
4. Peter Chenoweth
5. David Dreesen
6. James Floyd, Jr.
7. Ian Gardner
8. Robert Gilbert
9. Thomas Herdt
10. Kent Hoblet
11. Lonnie King
12. Bob Larson
13. Kerry Lissemore
14. Jeanne Lofstedt
15. Reuben Mapletoft
16. J. McClure
17. Lance Perryman
18. Otto Radosits
19. David Reeves
20. Charles Rhodes
21. Allen Roussel
22. Mark Spire
23. Jeffrey Tyler
24. Dwight Wolf

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

## Exhibit B

### Academic Panel 1<sup>st</sup> Survey Interim Feedback Report

This report summarizes replies to the 1<sup>st</sup> survey of the Academic Delphi panel members. *This brief report is focused on helping you be more informed as you complete the 2<sup>nd</sup> survey.* (A full summary of Academic panel's data will be included in the final report that 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 2<sup>nd</sup> survey and averages and the ranges of the middle 50% of replies (between the 25<sup>th</sup> & 75<sup>th</sup> percentiles) are noted in that survey. When there is a difference between self-rated forecasting “experts” (those rating themselves as better than the panel average on question #30, 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), their respective means are noted. For example, under item #1 in the first section of the 2<sup>nd</sup> survey (“Use of non-DVMs, such as veterinary technicians”), the following notation is presented:

*Average = 4.6 & Mid-50% = 4 to 5; CDN = 5.0 & US = 4.5; Experts = 5.2 (vs. 4.1).*

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 or 5. The Canadian mean was 5.0 and the US mean was 4.5. The self-rated “expert” group had an average rating of 5.2 while the “less expert” group had a mean of 4.1.

***Please review this feedback prior to responding to the 2<sup>nd</sup> survey.***

#### **I. Factors Influencing Demand for Food Supply Veterinarians in Academic Careers**

The first section asked you to rate the influence of different demand issues. The highest-rated influences driving *increases* in future demand are:

- Zoonotic disease-related human health concerns
- Public concerns over food safety
- Public concerns over bio-terrorism
- Need to understand animal-human health eco-systems

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

- Federal and/or State/Provincial budgetary constraints

- Curtailment of government support of veterinary services

## II. Future Demand Estimates for Academic Food Supply Veterinary Careers

Panel members saw slightly increasing demand for academic food supply veterinarians (mean = 5.2 where “5” is “Increase Slightly”). The middle 50% (25<sup>th</sup> to 75<sup>th</sup> percentile) rated demand as 5 or 6. “Experts” (vs. less expert forecasters) saw higher levels of demand. (See question #3 in the second section of the 2<sup>nd</sup> survey.)

Additional questions asked for the “most likely” range of changes in future demand for several time periods. The mid-points of those range estimates are used to calculate average demand estimates for several time periods. The group averages and ranges (middle 50%) are noted in the 2<sup>nd</sup> survey (in question #4). The “expert” (versus “less expert”) group tended to see *higher* increasing demand (but this difference was not statistically strong). Canadians tended to see higher demand than US members up until 2010.

Panel members seeing higher future demand (compared to those below the panel average) rated the following “demand influences” as having a significantly *more positive (or less negative)* influence on demand:

- Public concerns over food safety
- Requiring third-party certification or verification of standards
- Move to larger sized producer operations
- Client concerns about veterinary service costs

“Experts” rated these four “demand influences” significantly higher (i.e., more positive or less negative) than the “less-expert” forecasters.

## II. Factors Influencing the Supply for Academic Food Supply Veterinarians

The more extreme negative influences on the future supply of academic 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
- Little exposure to food supply career options in college
- Lack of positive role models in veterinary food supply practice
- High debt load of veterinary school graduates
- Perceived lack of demand for food animal skills

## III. Projected Shortage or Surplus of Academic Food Supply Veterinarians

The panel generally sees future shortages over the next several years. It is striking, however, how wide ranging the estimates of this shortage are. Several panel members found this task quite challenging and some felt that they could not provide reliable estimates.

Across the estimates, there was a pattern of Canadians seeing less of a shortage than US-focused panel members. The contrasts with self-rated forecasting expertise were even more striking. Experts' estimates of the shortage tended to be over two times higher (more extreme shortages) than those of less expert panel members.

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

The patterns that are starting to emerge tell an interesting story for those in academic food supply veterinary careers and one that is different from other food supply veterinary career areas! Your replies to that 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)

## Exhibit C

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

This report summarizes replies to the 2<sup>nd</sup> survey of the Academic Delphi panel members. *This brief report is focused on helping you be more informed as you complete the 3<sup>rd</sup> and final survey.* (A full summary of Academic panel's data will be included in the final report that 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 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 averages and the ranges of the middle 50% of replies (between the 25<sup>th</sup> & 75<sup>th</sup> percentiles) are noted in that survey. When there is a difference between self-rated forecasting “experts” (those rating themselves as better than the panel average on question #30, 1<sup>st</sup> survey) versus those rating themselves as “less expert” in making forecasts, those contrasts are noted. Where Canadian & US members had a rating difference of .5 or more (on the 7- point scale), their respective means are noted. For example, item #1 in the first section of the 2<sup>nd</sup> survey (“Federal and/or State/Provincial budgetary constraints”), the following notation is presented:

*Average = 3.4 & Mid-50% = 3 to 4*

This indicates that the average of the panel was 3.4 on a 7-point scale (between “3. Slight Decrease” and “4. No Influence”) and the middle-50% of panelists rated it 3 or 4. There are not significant differences in the averages between the Canadian and US and the expert and less-expert sub-groups, so those averages are not reported. 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 prior to responding to the 3<sup>rd</sup> survey.***

#### **IV. Factors Influencing Demand for Food Supply Veterinarians in Academic 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:

- Zoonotic disease-related human health concerns
- Need for research on food safety concerns
- Need to address bio-security and agri-terrorism related threats
- Junior faculty replacing retirees
- Public concerns over food safety
- Need for research on disease and animal health

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

- Reductions in clinics and food animal cases in hospitals
- Faculty positions going to other areas
- Loss of resources to other areas in veterinary colleges
- Signals to students that the food animal area is less important
- Federal and/or State/Provincial budgetary constraints

## V. Future Demand Estimates for Academic Food Supply Veterinary Careers

Panel members tended to see slightly increasing demand for academic food supply veterinarians (mean = 4.8 where “5” is “Increase Slightly”). The middle 50% (25<sup>th</sup> to 75<sup>th</sup> percentile) rated demand as 4 or 5.5. “Experts” (vs. less expert forecasters) saw higher levels of demand.

Additional questions asked for the “most likely” changes in future demand for several time periods. The group average always forecasts increasing demand (+2% to +5%) and ranges (middle 50%) tend to be around 0% to 5% increases. The “expert” (versus “less expert”) group tended to see *higher* increasing demand (but these differences are not statistically strong). Similarly, US panel members tended to see higher increases in demand (but these are not statistically strong).

The 2<sup>nd</sup> survey evaluated several skill and activity areas suggested in the 1<sup>st</sup> survey comments where there will be higher or lower demand relative to the general pattern noted above. The areas of more extreme *decreasing* demand noted are:

- Hospital-based food animal treatment
- Ambulatory services for individual animals
- Reproductive medicine for individual animals
- Food animal surgeries

Activities where there is the highest *increasing* demand are:

- Public health related roles
- Bio-security related activities
- Food quality & safety tasks
- Application of quantitative analysis & information management skills

## VI. Factors Influencing the Supply for Academic Food Supply Veterinarians

Factors influencing the supply of DVMs entering academic careers were evaluated in both prior surveys (see question 7, 3<sup>rd</sup> survey). The more extreme *negative influences*

on the future supply for academic food supply veterinarians noted in the 1<sup>st</sup> and 2<sup>nd</sup> surveys are:

- Less emphasis on food animal practice in veterinary colleges
- Little exposure to food supply career options in college
- Lack of positive role models in veterinary food supply practice
- Continued selection processes that favor non-FSVM oriented students
- Need to work long hours and emergency calls

The 2<sup>nd</sup> survey evaluated several supply-influences drawn from the panel's comments to the 1<sup>st</sup> survey. The highest rated *positive* supply-influences identified are:

- Targeted scholarship programs for FSVM-tracked students
- Initiatives targeting recruitment and selection of FSVM-oriented student into Colleges of Veterinary Medicine
- Initiatives promoting FSVM career interests to younger students
- Promoting public awareness of FSVM profession's societal contributions

## **VII. Projected Shortage or Surplus of Academic Food Supply Veterinarians**

The panel generally sees a future shortage of academic food supply veterinarians over the next several years. The average of the general question on the future pattern (see question 9, 3<sup>rd</sup> survey) is 5.8 (just below "6. Shortage"). The average shortage estimate over several time periods was -5% and the middle-50% of panel members always projected a shortage and included a -2.0% or greater shortage. Self-rated experts consistently saw more extreme shortages. For the near-term time periods these were close to double the shortage seen by the less-expert group. There was a pattern of Canadians seeing less of a shortage than US-focused panel members (but this was not statistically strong).

### **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 academic careers. Your replies to the third and final survey will add to and clarify this story even more. Besides making the final estimates of some previously seen questions, you will evaluate several solutions for the shortage problem note above.

Thank you for your continuing help and involvement!

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July 7, 2005

## Section I. Factors Influencing Future Demand for Veterinarians in the Academic 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 concern over food Safety	1 <sup>st</sup>	0	0	100	6.0	.77	5 to 7	23
2. Use of non-DVMs, such as veterinary technicians	1 <sup>st</sup>	9.6	42.9	47.6	4.6	1.16	4 to 5.5	21
2. Use of non-DVMs, such as veterinary technicians	2 <sup>nd</sup>	4.8	42.9	52.4	4.7	.91	4 to 5	21
3. Public concern over bio-terrorism	1 <sup>st</sup>	0	8.7	91.3	5.7	.89	5 to 6	23
4. Zoonotic disease-related human health concerns	1 <sup>st</sup>	0	0	100	6.2	.74	6 to 7	23
5. Required third party certification or verification of standards	1 <sup>st</sup>	0	14.3	85.7	5.4	.87	5 to 6	21
6. Limited public understanding of food quality and safety issues	1 <sup>st</sup>	14.3	23.8	61.9	4.9	1.48	4 to 6	21
6. Limited public understanding of food quality and safety issues	2 <sup>nd</sup>	20	10	70	4.9	1.50	4 to 6	20
7. More meat consumption in the US and Canada	1 <sup>st</sup>	0	39.1	60.9	4.9	.87	4 to 5	23
8. More access to global markets for food exports	1 <sup>st</sup>	0	21.7	78.3	5.4	1.03	5 to 6	23
8. More access to global markets for food exports	2 <sup>nd</sup>	0	5	95	5.9	.85	5. to 6.8	20
9. Changing dietary habits in third-world countries	1 <sup>st</sup>	4.5	31.8	63.6	5.0	1.05	4 to 6	22
9. Changing dietary habits in third-world countries	2 <sup>nd</sup>	0	23.8	76.2	5.4	.98	4.5 to 6	21
10. Need to protect indigenous wildlife from exotic diseases	1 <sup>st</sup>	0	34.8	65.2	4.8	.67	4 to 5	23
11. Federal and/or state/provincial budgetary constraints	1 <sup>st</sup>	55	20	25	3.7	1.66	3 to 4.8	20
11. Federal and/or state/provincial budgetary constraints	2 <sup>nd</sup>	66.7	19	14.3	3.4	1.12	3 to 4	21
11. Federal and/or state/provincial budgetary constraints	3 <sup>rd</sup>	84.2	5.3	10.5	3.1	1.05	3 to 3	19
12. Curtailment of government support of veterinary services	1 <sup>st</sup>	45.5	22.7	31.8	4.0	1.43	3 to 5	22
12. Curtailment of government support of veterinary services	2 <sup>nd</sup>	52.4	33.3	14.3	3.6	.98	3 to 4	21
13. Increasing concern for animal wildlife	1 <sup>st</sup>	0	18.2	81.8	5.5	1.01	5 to 6	22
13. Increasing concern for animal wildlife	2 <sup>nd</sup>	0	9.5	90.5	5.6	.92	5 to 6	21
14. Increasing concern for animal health	1 <sup>st</sup>	0	13	87	5.4	.79	5 to 6	23
15. Need to understand animal-human health eco-systems	1 <sup>st</sup>	0	0	100	5.6	.73	5 to 6	22
16. Availability of highly technical or specialized services	1 <sup>st</sup>	4.3	8.7	87	5.5	.99	5 to 6	23
17. Veterinary services agreements required for agri-business loans	1 <sup>st</sup>	0	35	65	4.8	.77	4 to 5	20
18. Growing need to track animals entering the food chain	1 <sup>st</sup>	0	26.1	73.9	5.3	.97	4 to 6	23
18. Growing need to track animals entering the food chain	2 <sup>nd</sup>	0	14.3	85.7	5.5	.93	5 to 6	21
19. Constraints on non-DVMs giving prescription drugs	1 <sup>st</sup>	4.8	42.9	52.4	4.7	.97	4 to 5	21

<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	1 <sup>st</sup>	20	50	30	4.2	1.50	4 to 5	20
21. Move to larger sized producer operations	1 <sup>st</sup>	21.7	13	65.2	4.9	1.46	4 to 6	23
21. Move to larger sized producer operations	2 <sup>nd</sup>	14.3	19	66.7	4.9	1.14	4 to 6	21
22. Client use of veterinary herd management services	1 <sup>st</sup>	4.5	18.2	77.3	5.1	.99	4.8 to 6	22
22. Client use of veterinary herd management services	2 <sup>nd</sup>	0	19	81	5.3	.90	5 to 6	21
23. Client concerns about veterinary service costs	1 <sup>st</sup>	30	50	20	4.0	1.26	3 to 4	20
23. Client concerns about veterinary service costs	2 <sup>nd</sup>	19	66.7	14.3	4.1	1.06	4 to 4	21
24. Lack of veterinarian's practice management and business skill	1 <sup>st</sup>	23.8	38.1	38.1	4.3	1.49	3.5 to 5	21
24. Lack of veterinarian's practice management and business skill	2 <sup>nd</sup>	19	38.1	42.9	4.4	1.03	4 to 5	21
25. Part-time farmers needing more veterinary services	1 <sup>st</sup>	4.3	39.1	47.8	4.7	1.53	4 to 5	23
25. Part-time farmers needing more veterinary services	2 <sup>nd</sup>	0	60	40	4.6	.83	4 to 5	20
26. Demand for diagnostic laboratory services	2 <sup>nd</sup>	0	14.3	85.7	5.6	.98	5 to 6	21
27. Need for research on disease and animal health	2 <sup>nd</sup>	0	0	100	6.0	.71	5.5 to 6.5	21
27. Need for research on disease and animal health	3 <sup>rd</sup>	0	15.8	84.2	5.5	.96	5 to 6	19
28. Need to address bio-security and agri-terrorism related threats	2 <sup>nd</sup>	0	0	100	6.1	.74	5.5 to 7	21
29. Junior faculty replacing retirees	2 <sup>nd</sup>	4.8	4.8	90.5	6.1	1.16	5 to 7	21
30. Need for research on food safety concerns	2 <sup>nd</sup>	0	0	100	6.1	.67	6 to 6.5	21
31. Need for research on animal production and environmental concerns	2 <sup>nd</sup>	4.8	9.5	85.7	5.7	1.15	5 to 7	21
32. Admission of students without agricultural background	2 <sup>nd</sup>	50	25	25	3.8	1.11	3 to 4.8	20
32. Admission of students without agricultural background	3 <sup>rd</sup>	47.4	42.1	10.5	3.7	.82	3 to 4	19
33. Reductions in clinics and food animal cases in hospitals	2 <sup>nd</sup>	66.7	28.6	4.8	3.1	1.26	2 to 4	21
33. Reductions in clinics and food animal cases in hospitals	3 <sup>rd</sup>	84.2	15.8	0	2.9	.66	2 to 3	19
34. Faculty positions going to other areas	2 <sup>nd</sup>	71.4	14.3	14.3	3.1	1.55	2 to 4	21
34. Faculty positions going to other areas	3 <sup>rd</sup>	89.5	10.5	0	2.6	.76	2 to 3	19
35. Signals to students that the food animal area is less important	2 <sup>nd</sup>	63.2	21.1	15.8	3.3	1.64	2 to 4	19
35. Signals to students that the food animal area is less important	3 <sup>rd</sup>	84.2	15.8	0	2.8	.69	2 to 3	19
36. Less student interest in food supply related careers	2 <sup>nd</sup>	78.9	5.3	15.8	3.3	1.64	2 to 3	19
36. Less student interest in food supply related careers	3 <sup>rd</sup>	84.2	15.8	0	2.9	.66	2 to 3	19
37. Loss of resources to other areas in veterinary colleges	2 <sup>nd</sup>	66.7	19.0	14.3	3.2	1.75	2 to 4	21
37. Loss of resources to other areas in veterinary colleges	3 <sup>rd</sup>	89.5	10.5	0	2.5	.91	2 to 3	19

## 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. Application of quantitative analysis & information management skills	2 <sup>nd</sup>	0	4.8	95.2	6.1	.87	5.5 to 7	21
2. Public health related roles	2 <sup>nd</sup>	0	0	100	6.2	.68	6 to 7	21
3. Diagnostic laboratory activities	2 <sup>nd</sup>	0	14.3	85.7	5.7	.96	5 to 6	21
4. Agri-business and management skill training activities	2 <sup>nd</sup>	4.8	4.8	90.5	5.6	1.02	5 to 6	21
5. Economic analysis and assessment activities	2 <sup>nd</sup>	4.8	9.5	85.7	5.5	1.21	5 to 6	21
6. Food quality and safety tasks	2 <sup>nd</sup>	0	4.8	95.2	6.1	.74	6 to 6.5	21
7. Bio-security related activities	2 <sup>nd</sup>	0	0	100	6.1	.67	6 to 6.5	21
8. Field and producer out-reach (extension) roles	2 <sup>nd</sup>	14.3	14.3	71.4	5.0	1.30	4 to 6	21
9. Reproductive medicine for herds	2 <sup>nd</sup>	23.8	23.8	52.4	4.5	1.37	3.5 to 5.5	21
10. Disease investigation and diagnoses tasks	2 <sup>nd</sup>	4.8	9.5	85.7	5.3	.96	5 to 6	21
11. Application of high-level species-specific expertise	2 <sup>nd</sup>	4.8	9.5	85.7	5.7	1.19	5 to 7	21
12. Ambulatory services for individual animals	2 <sup>nd</sup>	66.7	19	14.3	3.0	1.24	2 to 3	21
13. Reproductive medicine for individual animals	2 <sup>nd</sup>	57.1	28.6	14.3	3.0	1.30	2 to 4	21
14. Hospital-based food animal treatment	2 <sup>nd</sup>	66.7	23.8	9.5	2.8	1.26	2 to 4	21
15. Food animal surgeries	2 <sup>nd</sup>	61.9	28.6	9.5	3.1	1.04	2 to 4	21

<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 Academic 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>	87.0	8.7	4.3	2.4	1.16	2 to 3	23
1. Less emphasis on food animal practice in veterinary colleges	2 <sup>nd</sup>	95.2	4.8	0	2.6	.68	2 to 3	21
2. More women veterinarians entering the workforce	1 <sup>st</sup>	69.6	26.1	4.3	2.9	1.04	2 to 4	23
3. Physical demands of large animal veterinary work	1 <sup>st</sup>	68.2	27.3	4.5	3.0	1.00	2 to 4	22
4. Need to work long hours and emergency calls	1 <sup>st</sup>	61.9	33.3	4.8	2.9	1.48	2 to 4	21
4. Need to work long hours and emergency calls	2 <sup>nd</sup>	70	25	5	2.9	1.07	2 to 4	20
4. Need to work long hours and emergency calls	3 <sup>rd</sup>	73.7	26.3	0	3.2	.60	3 to 4	19
5. Little exposure to food supply career options in college	1 <sup>st</sup>	81.8	9.1	9.1	2.6	1.22	1.8 to 3	22
5. Little exposure to food supply career options in college	2 <sup>nd</sup>	85.7	9.5	4.8	2.7	.96	2 to 3	21
6. Lack of food supply practice-related externships for students	1 <sup>st</sup>	63.6	27.3	9.1	3.0	1.21	2 to 4	22
6. Lack of food supply practice-related externships for students	2 <sup>nd</sup>	71.4	19	9.5	3.2	.93	3 to 4	21
7. Lack of positive role models in veterinary food supply practice	1 <sup>st</sup>	66.7	28.6	4.8	2.7	1.27	1.5 to 4	21
7. Lack of positive role models in veterinary food supply practice	2 <sup>nd</sup>	75	20	5	2.8	1.06	2 to 3.8	20
7. Lack of positive role models in veterinary food supply practice	3 <sup>rd</sup>	73.7	26.3	0	2.9	.88	2 to 4	19
8. Poor income opportunities in rural areas	1 <sup>st</sup>	42.9	52.4	4.8	3.5	.98	3 to 4	21
9. Lack of cultural and recreational opportunities in rural areas	1 <sup>st</sup>	59.1	27.3	13.6	3.3	1.08	2.8 to 4	22
10. Lack of spousal career options in rural areas	1 <sup>st</sup>	66.7	28.6	4.8	2.9	1.04	2 to 4	21
11. Limited lifestyle and career opportunities in rural areas	1 <sup>st</sup>	60	35	5	3.1	1.10	2 to 4	20
12. Federal and/or state/provincial budgetary constraints	1 <sup>st</sup>	68.2	27.3	4.5	3.0	1.17	2 to 4	22
12. Federal and/or state/provincial budgetary constraints	2 <sup>nd</sup>	75	25	0	3.0	.76	2 to 3.8	20
13. High debt load of veterinary school graduates	1 <sup>st</sup>	78.3	17.4	4.3	2.8	1.13	2 to 3	23
13. High debt load of veterinary school graduates	2 <sup>nd</sup>	71.4	14.3	14.3	3.1	1.15	2 to 4	21
13. High debt load of veterinary school graduates	3 <sup>rd</sup>	73.7	26.3	0	2.8	.90	2 to 4	19
14. Expected high number of food supply veterinarians retiring in the near future	1 <sup>st</sup>	21.7	17.4	60.9	4.5	1.31	4 to 5	23
14. Expected high number of food supply veterinarians retiring in the near future	2 <sup>nd</sup>	9.5	23.8	66.7	4.8	1.29	4 to 6	21
14. Expected high number of food supply veterinarians retiring in the near future	3 <sup>rd</sup>	15.8	15.8	68.4	4.6	1.17	4 to 5	19
15. Limited capacity of existing veterinary colleges in the US and/or Canada	1 <sup>st</sup>	52.6	26.8	10.5	3.4	.90	3 to 4	19
16. Perceived lack of demand for food animals	1 <sup>st</sup>	71.4	23.8	4.8	2.8	1.09	2 to 4	21
17. Requirement for education beyond a DVM	1 <sup>st</sup>	69.6	17.4	13	3.0	1.26	2 to 4	23

<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.

17. Requirement for education beyond a DVM	2 <sup>nd</sup>	61.9	23.8	14.3	3.6	1.03	3 to 4	21
17. Requirement for education beyond a DVM	3 <sup>rd</sup>	42.1	47.4	10.5	3.7	1.05	3 to 4	19
18. Initiatives promoting FSVM career interests to younger students	2 <sup>nd</sup>	0	10.5	89.5	5.2	.60	5 to 6	19
19. Promoting public awareness of FSVM profession's societal contributions	2 <sup>nd</sup>	0	14.3	85.7	5.1	.63	5 to 5.5	21
20. Initiatives targeting recruitment and selection of FSVM-oriented students into Colleges of Veterinary Medicine	2 <sup>nd</sup>	0	4.8	95.2	5.3	.72	5 to 5.5	21
21. Targeted scholarship programs for FSVM-tracked students	2 <sup>nd</sup>	0	4.8	95.2	5.6	.75	5 to 6	21
22. Fewer applicants with rural or agricultural background	2 <sup>nd</sup>	80	10	10	3.1	1.25	2.3 to 3	20
22. Fewer applicants with rural or agricultural background	3 <sup>rd</sup>	68.4	26.3	5.3	3.1	.97	2 to 4	19
23. Rewards provided relative to faculty in other areas and private practice options	2 <sup>nd</sup>	45	30	25	3.7	1.18	3 to 4.8	20
23. Rewards provided relative to faculty in other areas and private practice options	3 <sup>rd</sup>	78.9	21.1	0	3.0	.71	2 to 3	19
24. Continued selection processes that favor non-FSVM oriented students	2 <sup>nd</sup>	78.9	15.8	5.3	2.8	1.34	2 to 3	19
24. Continued selection processes that favor non-FSVM oriented students	3 <sup>rd</sup>	89.5	10.5	0	2.6	.76	2 to 3	19

## Section IV. Solutions to Shortages in the Academic Sector

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	50	16.7	4.1	1.68	3 to 5	18
2. Expand the Centers for Excellence concept where nationally recognized focus on different food supply sectors	3 <sup>rd</sup>	26.3	52.6	21.1	4.6	1.64	3 to 5	19
3. Focused recruitment of high school and college students with food supply interests into veterinary colleges	3 <sup>rd</sup>	21.1	47.4	31.6	4.8	1.39	4 to 6	19
4. Increased focus of food supply coverage early in DVM curriculum	3 <sup>rd</sup>	26.3	47.4	26.3	4.6	1.61	3 to 6	19
5. Expanded business and practice management coverage in DVM curriculum	3 <sup>rd</sup>	52.6	21.1	26.3	3.8	2.10	2 to 6	19
6. Expanded postgraduate fellowships in food supply areas	3 <sup>rd</sup>	5.3	31.6	63.2	5.9	1.20	5 to 7	19
7. Expanded paid work-study programs during the final year of DVM	3 <sup>rd</sup>	26.3	57.9	15.8	4.4	1.54	3 to 5	19
8. More involvement of food supply practitioners in training veterinary students	3 <sup>rd</sup>	42.1	42.1	15.8	4.1	1.56	3 to 5	19
9. Provide expanded job placement services in the food supply veterinary medicine areas	3 <sup>rd</sup>	42.1	42.1	15.8	3.8	1.87	2 to 5	19
10. Appointment of more food supply faculty at Colleges of Veterinary Medicine	3 <sup>rd</sup>	26.3	36.8	36.8	4.7	1.66	3 to 6	19
11. Paid externship requirement in food supply medicine during the summer	3 <sup>rd</sup>	31.6	52.6	15.8	4.2	1.62	3 to 5	19
12. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities	3 <sup>rd</sup>	21.1	57.9	21.1	4.7	1.41	4 to 5	19
13. Student debt repayment and scholarship programs for service in food supply areas of need	3 <sup>rd</sup>	0	47.4	52.6	5.6	.96	5 to 6	19
14. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities	3 <sup>rd</sup>	26.3	42.1	31.6	4.6	1.71	3 to 6	19
15. Low cost (subsidized) consulting in business and practice management for new food supply DVMs	3 <sup>rd</sup>	55.6	38.9	5.6	3.3	1.78	1.8 to 5	18
16. Mentoring initiatives for students and those starting a food supply career	3 <sup>rd</sup>	10.5	42.1	47.4	5.3	1.56	4 to 7	19
17. Focused recruitment of women students in food supply areas	3 <sup>rd</sup>	47.4	31.6	21.1	3.8	1.50	3 to 5	19
18. Development and dissemination of Business Best Practices for food supply veterinary enterprises	3 <sup>rd</sup>	47.4	26.3	26.3	3.8	2.07	2 to 6	19

<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.”