
Chapter 8

The Future Demand for Food Supply Veterinarians in Poultry Careers

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Introduction

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

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 25th and 75th 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 Poultry Veterinarians

The panel responded to both panel-suggested demand-related items that are unique 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 of additional issues influencing demand in the poultry FSVM sector. Nine additional items were derived from those open-ended comments for a total of 34 items. In the second survey, the 9 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 *increasing* future demand for poultry practice veterinarians (starting with the most influential issues and trends first):¹

Trends Increasing Demand

1. Public concerns over food safety (5.90 on a 7-point scale)²
2. Increased auditing of animal welfare (mean: 5.80)
3. Increased governmental and regulatory programs and requirements (mean: 5.65)
4. Increasing concern for animal welfare (mean: 5.63)

¹ Where significant differences between the ratings of the self-rated forecasting experts' sub-group versus the less-expert sub-group exist, those respective means are noted. There were not enough Canada-focused panel members completing the final survey to do a meaningful analysis of US versus Canada contrasts.

² 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.

5. Zoonotic disease-related human health concerns (mean: 5.43)
6. Export regulation and international trade-related requirements (mean: 5.40)
7. 3rd party certification or verification of standards (mean: 5.24)
8. Increasing concern for animal health (mean: 5.20)
9. Constraints on non-DVMs giving prescription drugs (mean: 5.00)
Note that self-rated experts (mean: 5.33) saw a significantly stronger relationship to demand increases than less-expert raters (mean: 4.50)
10. More access to global markets for food exports (mean: 5.00)
Note that self-rated experts (mean: 5.22) saw a significantly stronger relationship to demand increases than less-expert raters (mean: 4.83)

Note that items with a mean rating of 4.0 and 5.0 (between the “4. No Influence and “5. Slight Increase” scale anchor points) are not presented. See Exhibit D for a listing of these items as well as the distributions and mean ratings of all items used in the 1st, 2nd, or 3rd wave surveys. 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 trends or issues leading to decreases in the demand for poultry practice veterinarians. The survey items noted below are trends rated as *decreasing* future demand starting with the most influential factors first:

Trends Decreasing Demand

1. Governmental budget and program cut-backs (mean: 3.15)³
2. Mergers between firms within the poultry industry (mean: 3.30)
3. Curtailment of government support of veterinary services (mean: 3.32)

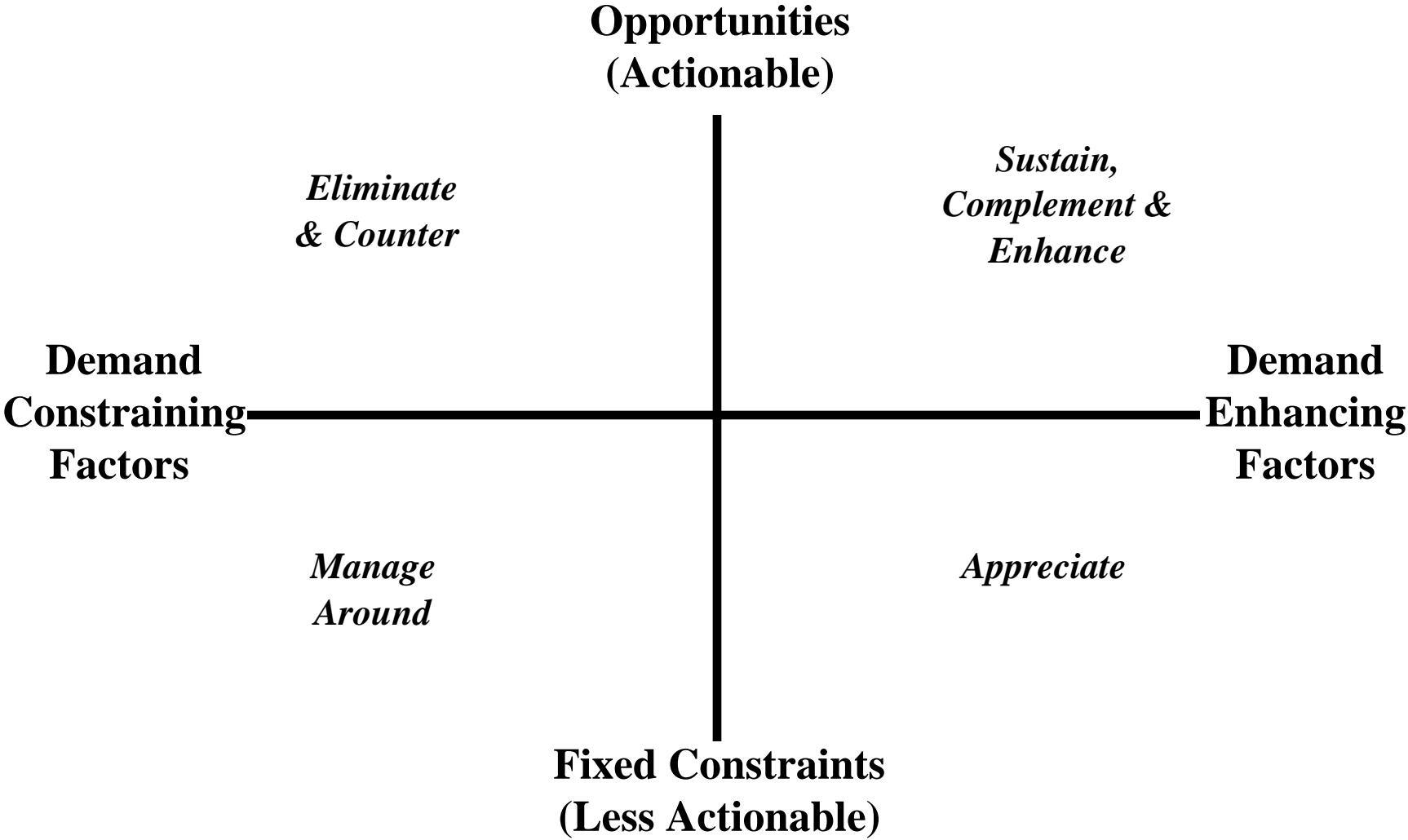
³ The items were rated on a 7-point Likert-type scale and evaluated based on their influence on future demand. The mean rating for each item is noted in parentheses. The following scale anchor points will help interpret those means: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence.

4. Low profit margins in the poultry industry (mean:3.37)
5. Client concerns about veterinary service costs (mean: 3.37)
6. Availability of drugs not requiring veterinary oversight (mean: 3.55)
7. Move to larger sized producer operations (mean: 3.58)
8. Lack of veterinarian’s practice management and business skill (mean: 3.59)
9. Federal and/or State/Provincial budgetary constraints (mean: 3.63)⁴
10. Use of non-DVMs, such as veterinary technicians (mean: 3.67)
Note that self-rated experts (mean: 3.89) saw a significantly weaker relationship to demand decreases than less-expert raters (mean: 3.44)
11. Slow adoption of new technologies by veterinarians (mean: 3.75)

The ratings of these trends and issues 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 more “actionable,” meaning that direct strategic actions can be taken by the profession *without extensive external resources or cooperation of external entities* to alter the expected pattern of influence suggested by the panel’s mean score. Others items identify issues that are fairly fixed constraints and are much less actionable. These items 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 general planning matrix useful in organizing the results and guiding future strategic action. The best targets for strategic

⁴ See Exhibit B for a listing of these items as well as the distributions and ratings of all items used in the 1st, 2nd, or 3rd 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 D 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.

Figure 1 Planning Matrix

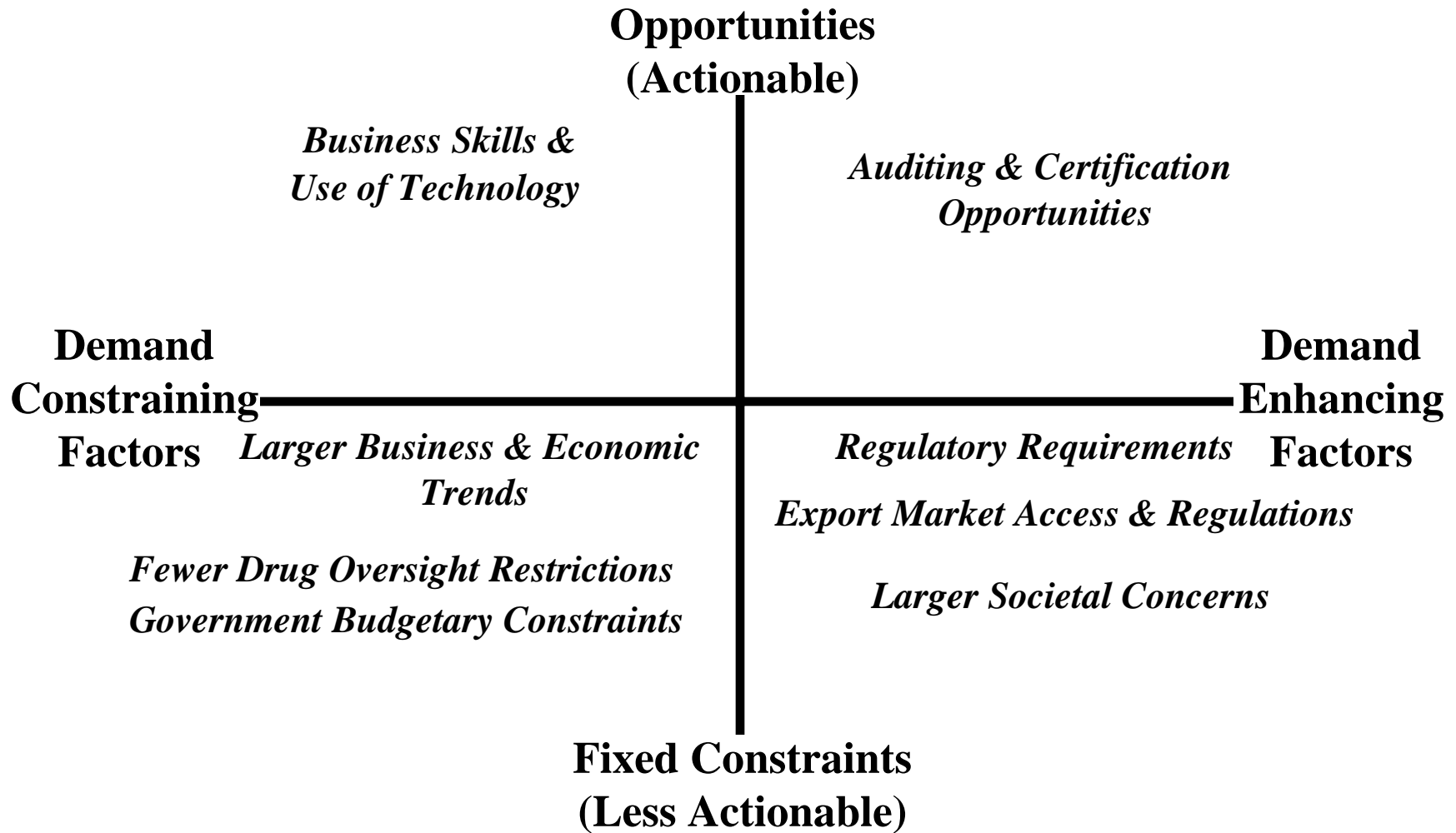


action are those in the “actionable” or top-half of that figure. In order to increase future demand, actionable demand-constraining factors (on the left-side of the figure) must be eliminated or countered in some fashion. The top, right-side quadrant represents actionable demand-enhancing opportunities 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 these constraints. They represent areas where the profession has less influence and may be areas that must be managed around rather than changed. This matrix will be used to interpret and draw strategic action implications for the panel’s ratings.

Figure 2 is an adaptation of Figure 1 that is used to organize the results from the above two listings. The listing of the 11 demand-decreasing items noted above fits on the left-side of Figure 2, while the 10 demand-increasing items logically fit on the right-side of that figure. Three of the 11 demand-decreasing items relate to the *Government Budgetary Constraints* theme noted in Figure 2. These are item 1 (government cut-backs), item 3 (curtailment of government support), and item 9 (budgetary constraints). These are the least actionable constraints on demand and fit in the lower-left quadrant. While there is some maneuvering room to help insure animal agriculture allocations are hurt less, the reality of large deficits represents a fairly fixed constraint that the profession must manage around. Item 6 (availability of drugs not requiring oversight) is another less actionable constraint that is based in governmental regulation. This is noted as *Fewer Drug Oversight Restrictions* in the lower-left quadrant of Figure 2. Similarly, item 2 (mergers within the poultry industry), item 4 (low profit margins), item 5 (client concerns about costs), item 7 (move to larger size operations), and item 10 (use of non-DVMs) all

Figure 2

Demand Diminishing & Enhancing Issues in the Poultry Sector



related to the *Larger Business & Economic Trends* theme. These are larger economic trends that will not be directly changed by strategic action. They are constraints that must be managed around. It is also noted in the lower-left quadrant of Figure 2. This is placed near the middle line because there is plenty of strategic opportunities in how the profession responds to the trends. In contrast, items 8 and 11 refer to veterinarians' practice management skills and resistance to new technologies. These are self-imposed constraints on demand that can be acted upon and lessened. With educational initiatives, veterinarians can be better prepared and this negative influence on demand can be changed. This issue is captured by the *Business Skill and Use of Technology* theme noted on the upper-right quadrant of Figure 2. It is a demand-diminishing factor that can be changed.

The 10 items noted in the listing of demand increasing trends and issues are the basis for the themes noted on the right-side of Figure 2. Several related to the *Larger Societal Concerns* theme noted in the lower-right quadrant. They cannot be directly changed and need to be appreciated for the demand increasing influence they have on the need for food supply veterinarians. These include item 1 (food safety concerns), item 4 (animal welfare concerns), item 5 (zoonotic human health concerns), item 8 (animal health concerns). Item 10 (access to global markets) and item 6 (export regulations) are related to a *Global Export Market Access & Regulations* theme and this is placed in the lower-right quadrant. Since there are some opportunities to influence these requirements this theme has been placed closer to the middle line. A related theme is *Regulatory Requirements*. This relates to item 3 (government and regulatory requirements) and item 9 (constraints on non-DVMs giving drugs). The remaining items, item 2 (animal welfare

auditing) and item 7 (certifications or verification of standards), are the most actionable in the sense that the profession can directly influence the standards and requirements that are developed. Shaping these standards can, in turn, have a direct positive influence on the demand for veterinary services. The Figure 2 theme related to these items is *Auditing & Certifications Opportunities*.

The Future Demand for Poultry Veterinarians

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 25th percentile and 75th percentile of the distribution, or inter-quartile range) and the point estimates include both the arithmetic mean and the median (or estimate at the 50th percentile) of the distribution of estimates. Figures 3 through 5 presents the results of 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 indicate between 1% to 2% increases in demand, the middle 50% range (those between the 25th and 75th percentile of the distribution) include estimates of both increasing and decreasing demand. Between 15-25% noted zero or negative numbers indicating forecasts of decreasing demand.

Figure 3

Short-Term Demand Change (2004-07)

2nd Survey Results:

- Mid-50% = +1.0% to +4.0%
- Mean = +1.9% (■)
- Median = +3.0% (▲)

3rd Survey Results:

- Mid-50% = 0% to +3.0%
- Mean = +1.3% (■)
- Median = +1.0 (▲)

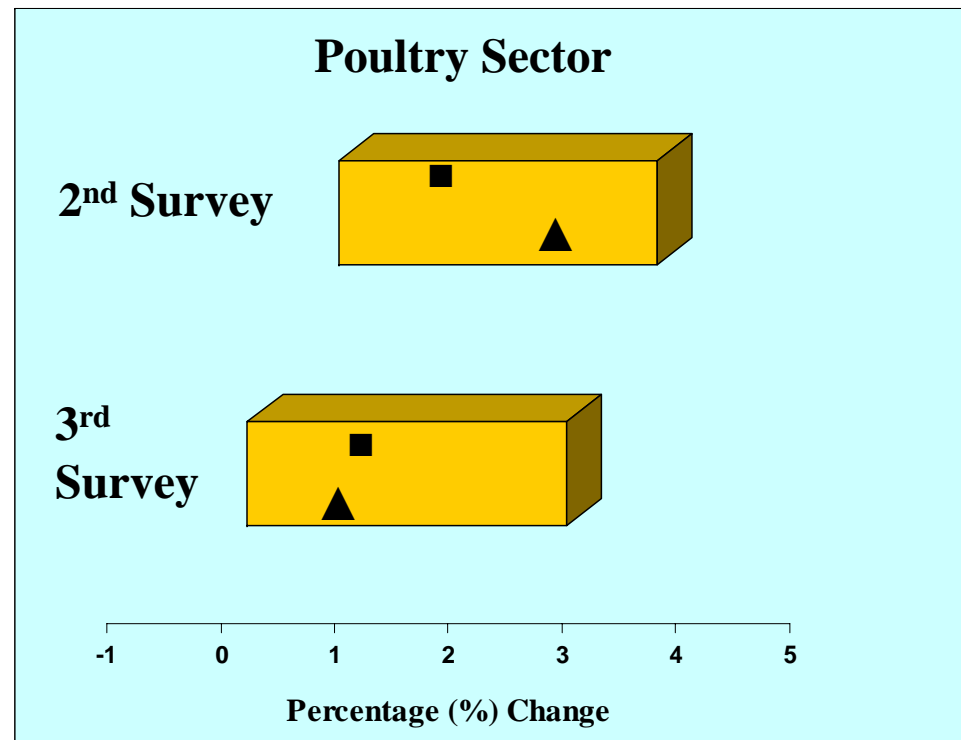


Figure 4

Medium-Term Demand Change (2007-10)

2nd Survey Results:

- Mid-50% = 0% to +2.8%
- Mean = +1.2% (■)
- Median = +1.0% (▲)

3rd Survey Results:

- Mid-50% = +1.0% to +2.0%
- Mean = +1.4% (■)
- Median = +1.0 (▲)

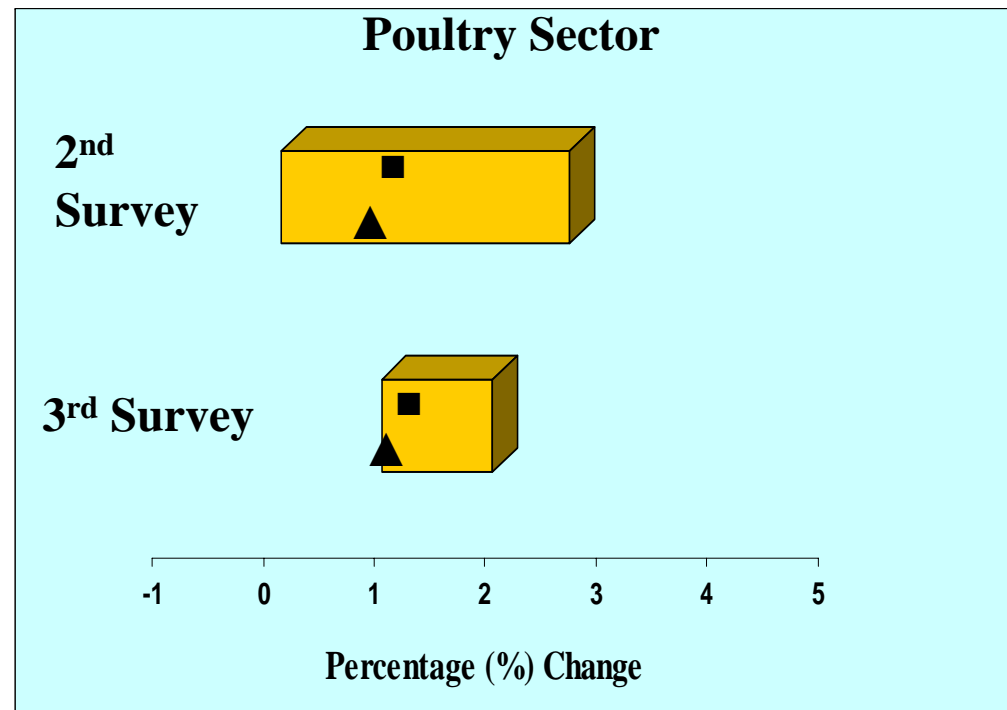


Figure 5

Long-Term Demand Change (2010-16)

2nd Survey Results:

- Mid-50% = 0% to +4.5%
- Mean = +2.3% (■)
- Median = +3.0% (▲)

3rd Survey Results:

- Mid-50% = 0% to +3.5%
chg
- Mean = +1.6% (■)
- Median = +2.0 (▲)

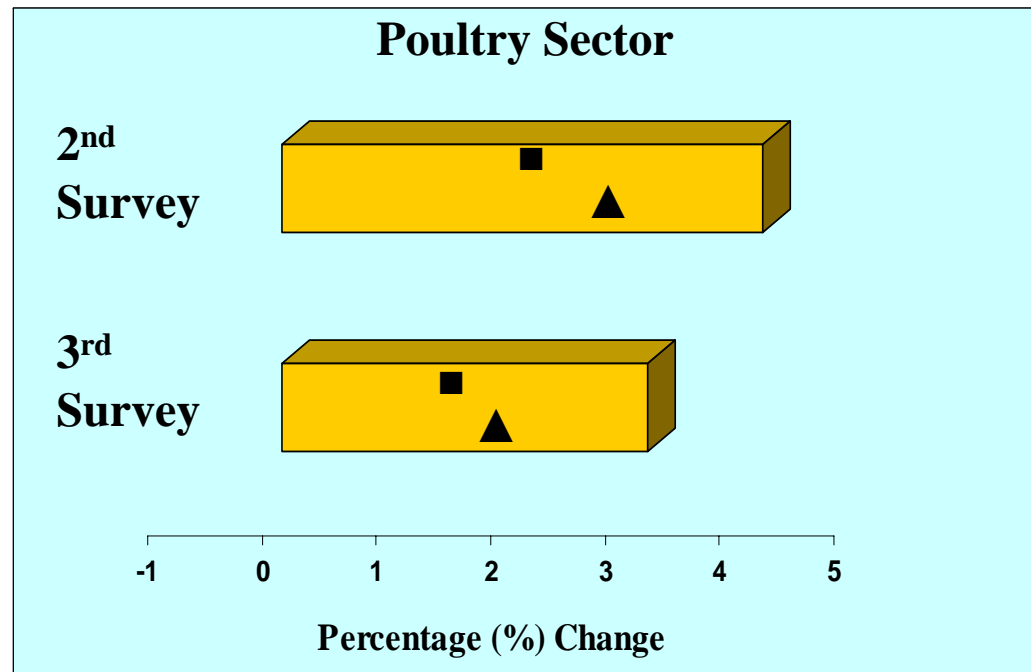


Figure 6

Future Demand Summary

Short-Term:

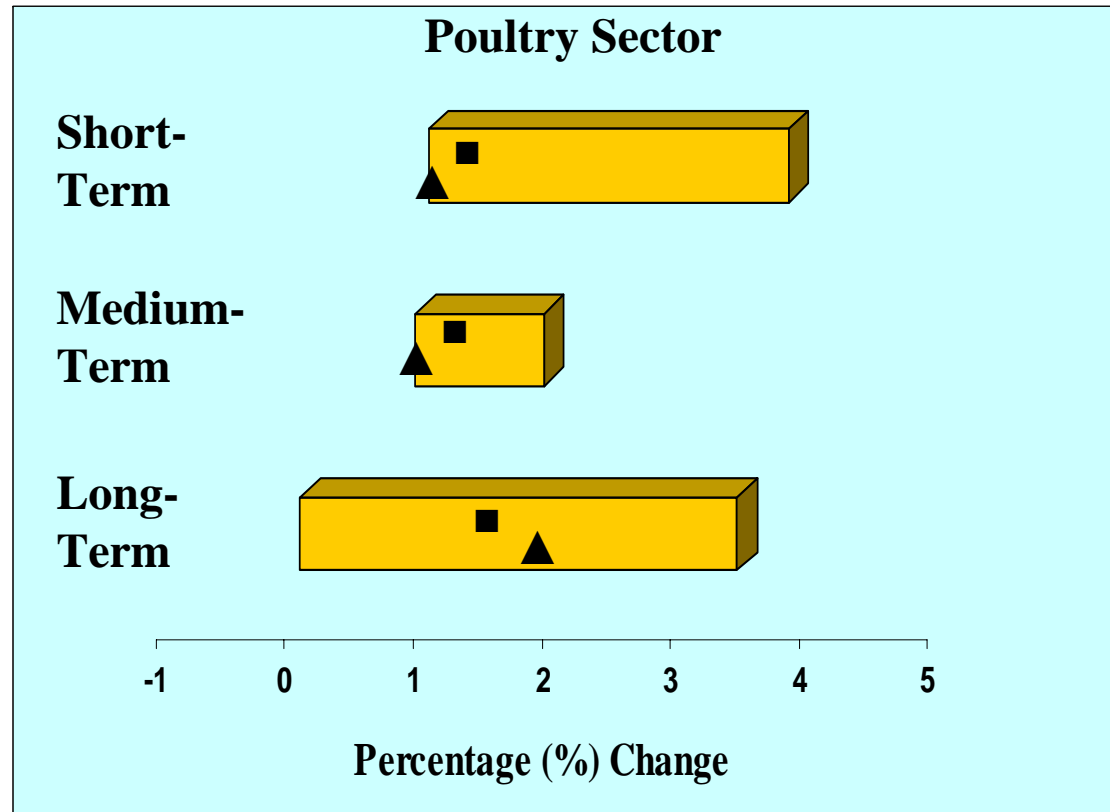
- Mid-50% = +1.0% to +4.0%
- Mean = +1.3% (■)
- Median = +1.0 (▲)

Medium-Term:

- Mid-50% = +1.0% to +2.0%
- Mean = +1.4% (■)
- Median = +1.0 (▲)

Long-Term:

- Mid-50% = 0% to +3.5%
- Mean = +1.6% (■)
- Median = +2.0 (▲)



On the whole, the ranges include many positive values, indicating increasing demand. Compared to other panels, the narrow middle 50% ranges indicates high agreement that demand will trend upward at a fairly low rate in the future. Comparisons between self-rated forecasting experts versus less-expert raters found significantly different views on the long-term (2010-16) demand prospects. Self-rated experts forecasted demand increases of +2.8% and their less-expert counterparts estimated demand increases to be +.4%. Rating of the medium- and short-term followed this same pattern but those differences were fairly minor and did not reach statistical significance. Figure 6 presents a summary of the panel forecasts from the final survey for all three time periods.

While the disagreement within the panel was not large, further analyses were done to understand the basis for contrasting views of future demand. Forecasts over the three time periods in the final survey were averaged and the panel was split at the median (1.67%) into relatively higher-demand and lower-demand sub-groups. The lower-demand sub-group included the three panel members making forecasts of decreasing demand. Only one significant difference between these sub-groups' ratings on the demand-influencing trends (summarized above) was found. The following demand-increasing influence had statistically significant *higher* ratings by the sub-group projecting higher (versus lower) increasing future demand:⁵

- Low profit margins in the poultry industry (mean equals 3.75 on a 7-point scale in the higher demand sub-group versus a mean of 3.20 in the lower demand sub-group)

⁵ The scale introduced earlier should be used in interpreting these mean values: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence, 5. Slight Increase, 6. Increase, 7. Strong Increase

Those more optimistic about future demand feel that low profit margins in the industry are a near neutral factor while those projecting less demand see profit margins as a demand-constraining factor.

Specialized Activities Increasing or Decreasing in Demand

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 substantial future increases or decreases in demand compared to the general pattern of demand for poultry veterinary services. These suggestions were content analyzed and 10 areas received multiple mentions and were used to form items that panel members rated in the second survey. The activity areas rated as having *higher* future demand (starting with the highest demand areas) are:

1. Food safety related activities (mean: 5.95 on a 7-point scale)⁶
2. Animal welfare related activities (mean: 5.75)
3. Governmental regulatory activities (mean: 5.45)
4. Activities related to export and international trade regulations (mean: 5.00)
5. Expertise in exotic or foreign diseases (mean: 4.79)
6. Jobs in public service roles (mean: 4.70)
Note that self-rated experts (mean: 5.10) saw a significantly higher increasing demand increases than less-expert raters (mean: 4.22)
7. Prescription writing (mean: 4.55)
8. Production medicine roles (mean: 4.10)
Note that self-rated experts (mean: 3.80) saw a significantly less increasing demand increases than less-expert raters (mean: 4.44)

⁶ 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.

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

1. Technical service activities supporting vaccines and pharmaceuticals (mean: 3.53 on a 7-point scale)⁷
2. Diagnostic services (mean: 3.95)

These results provide a few more details on the demand-increasing theme of *Auditing & Certification Opportunities* theme noted in Figure 2. Items 1 (food safety) and 2 (animal welfare) from the higher-demand listing both relate to this theme. Item 3 (regulatory activity) and item 4 (export regulations related activities) illustrate the *Regulatory Requirements* and *Export Market Access & Regulations* themes noted in the lower-right quadrant of Figure 2.

⁷ 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 Poultry

Veterinarians

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:

Trends Increasing Supply

1. Good income opportunities in the poultry area (mean: 5.32 on a 7-point scale)⁸
Note that self-rated experts (mean: 5.67) saw a significantly stronger relationship to supply increases than less-expert raters (mean: 4.89)
2. Good poultry area externship opportunities and student mentoring (mean: 5.15)

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:

⁸ The items were rated on a 7-point Likert-type scale and evaluated based on their influence on future supply of veterinarians entering poultry 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. Note that items between 4.0 and 5.0 are not presented but can be found on the listing of all items in Exhibit D.

Trends Decreasing Supply

1. Less emphasis on food animal practice in veterinary colleges (mean: 2.35)⁹
2. Little exposure to food supply career options in college (mean: 2.65)
3. Federal and/or State/Provincial budgetary constraints (mean: 3.11)
4. Perceived lack of demand for food animal skills (mean: 3.13)
5. Poor income opportunities in food supply careers (mean: 3.21)
Note that self-rated experts (mean: 4.43) saw a significantly weaker relationship to demand decreases than less-expert raters (mean: 3.57)
6. Lack of food supply practice-related externships for students (mean: 3.28)
7. More women veterinarians entering the workforce (mean: 3.29)
8. Fewer entering DVM students with agricultural backgrounds (mean: 3.32)
9. Lack of positive role models in veterinary food supply practice (mean: 3.38)
10. Animal rights campaigns aimed at veterinary students (mean: 3.42)
11. High debt load of veterinary school graduates (mean: 3.53)
12. Lack of spousal career options in rural areas (mean: 3.56)
13. Need to work long hours and emergency calls (mean: 3.58)

These supply-related factors can also be organized into the planning matrix

introduced earlier. Figure 7 captures the general pattern seen in the two above listings.

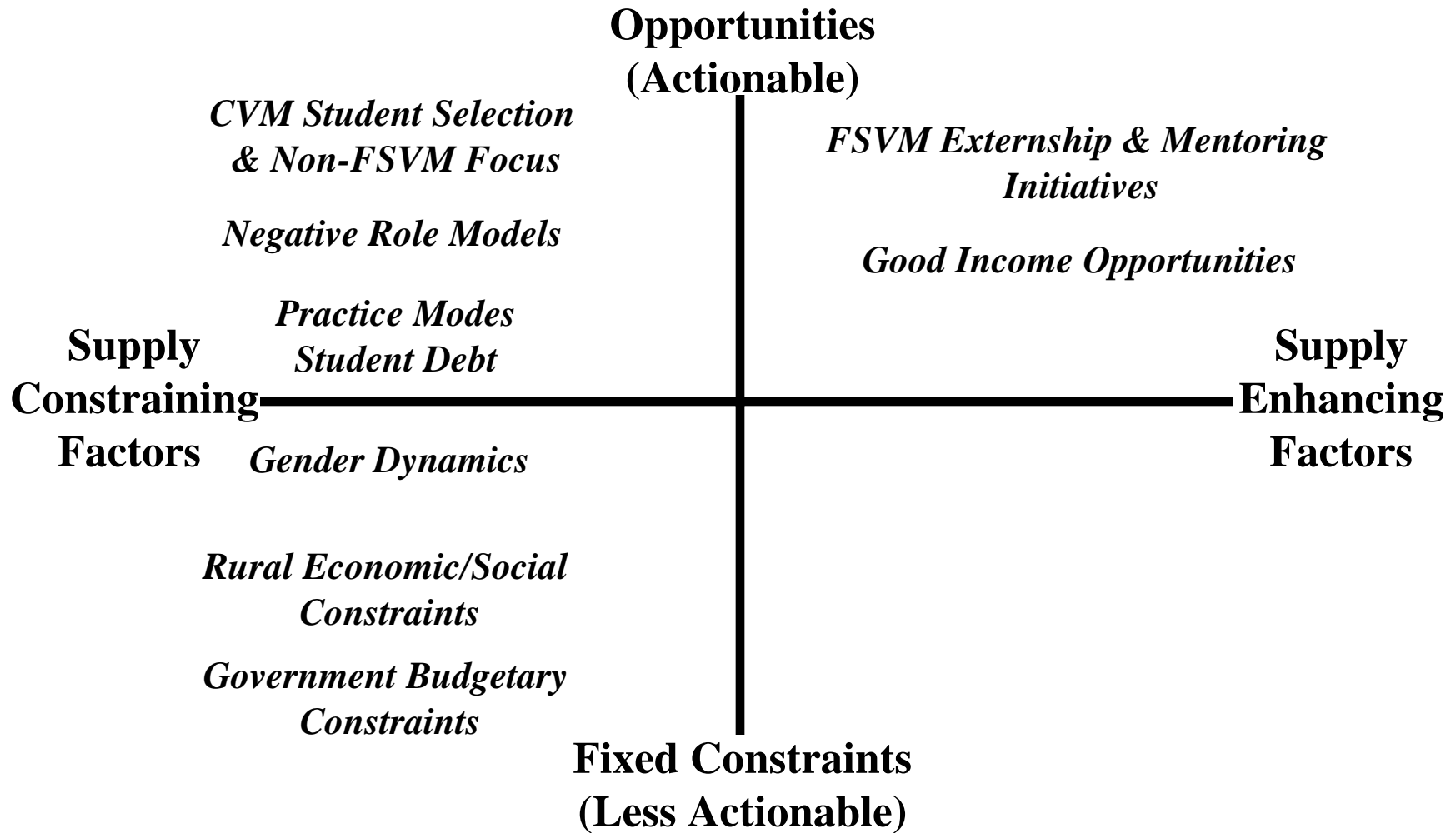
The list of 13 supply-decreasing factors identified by the panel all map to the left-side of the planning matrix. Many of the more extreme impediments (noted by low mean ratings) to the future entering supply of veterinarians are very actionable in that they do not strongly depend on the infusion of resources or the cooperation of entities outside of the veterinary profession. This places them in the upper-left quadrant of Figure 7. Five of the

⁹ The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future supply of poultry practice 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.

eight items with the lowest ratings (noting a stronger relationship to supply decreases) relate to the *CVM Student Selection & Non-FSVM Focus* theme. These include: item 1 (less emphasis on food animal practice), item 2 (little exposure to food supply career options), item 4 (perceived lack of demand for food animal skills), item 6 (lack of food supply externships), and item 8 (fewer entering students with agricultural backgrounds). The *Ineffective Role Models* theme is also placed in the upper-left quadrant and is noted by item 9. Item 13 (long hours and emergency calls) and item 5 (poor income opportunities) could be related to how poultry veterinary practices are organized (*Practice Modes*). There are some constraints and limits to the degree that these constraints can be eliminated. Animal health problems that need immediate attention will always occur outside of regular work hours. However, ways of organizing practices can lessen this problem. For these reasons, the *Practice Modes* theme is noted near the middle line indicating a mixture of fixed constraints and actionable opportunities. The final theme in the upper-left quadrant, *Student Debt*, is noted by item 11 (high debt load) and is similar and potentially related to the practice modes theme. Costs of professional education is increasing due to a number of larger societal trends that are not going to be eliminated with direct strategic action; however, we have seen recent efforts that promise to help the burden of student debt. For this reason, this theme is placed near the middle line but in the upper-left quadrant. Of course, better business models and practices that can deliver better value to producers will help incomes and, in turn, make poultry practice a better route for repaying student loans.

Figure 7

Supply Diminishing & Enhancing Issues in the Poultry Sector



The other supply-constraining items are less actionable and more heavily reflect fixed constraints that are less changeable by strategic action. These themes have been noted in the lower-left quadrant of Figure 7. Item 7 notes the increasing numbers of women in veterinary schools and the perception that they are less attracted to poultry practice careers. The increasing number of women attracted to professional careers is a societal trend that is a fixed constraint. At the same time, there are ways to make poultry practice careers more attractive to women. For these reasons, the related *Gender Dynamics* theme is placed near the middle line but in the lower-left quadrant. The *Rural Economics/Social Constraints* theme relates to item 12 (lack of spousal career options). Item 10 (animal rights campaigns) also relates to larger societal trends. *Governmental Budgetary Constraints* (item 3) is also a fairly fixed supply constraint that strategic action must recognize, but the reality of large deficits and competing demands for government budgets will not be changed. This should not be interpreted as suggesting that actions focused on getting a more adequate share of the federal budget for animal agriculture needs should not be pursued. Rather, the intended message is that alternative tactics, particularly those noted in the actionable quadrants, need to be central to a large strategy focused on maintaining an adequate supply of veterinarians into poultry practice. While items mapped to the lower-left quadrant present some opportunities for strategic action, the supply-decreasing factors at least partially based on fixed constraints need to be recognized in developing a larger strategy to improve the FSVM profession.

The panel noted only two supply-increasing trends. Both seemingly contradict items from the supply-decreasing factors described above. Their high ratings (above 5.0) and their actionable nature place them in the upper-right quadrant of Figure 7. Item 1

(good income opportunities) relates to an *Income Opportunities in Poultry* theme. It seems to contradict item 5 for the supply-decreasing list. Perhaps both realities coexist in the poultry area. Effective practices may be providing the basis for increasing incomes while less-effective practices serving producers with significant cost concerns and low profit margins in an industry seeing significant consolidation are seeing constrained income opportunities. Relative to the 4.0 center-point of the scale, the “good incomes” item at 5.32 (versus “poor incomes” item at 3.21), may be the stronger trend and more recent pattern in the FSVM profession. If the ratings of self-rated experts are used to settle this issue, then clearly the positive influence of “good income opportunities” (mean: 5.67) is the more substantial future trend. Their mean of 4.43 on the “poor income opportunities” survey item indicates that they simply do not agree with that premise. Item 2 (externship and mentoring opportunities) is the basis for the *FSVM Externships & Mentoring* theme. It also seems to contradict items 9 and 6 from the supply-decreasing trends listing. It is hard to resolve that contradiction with the existing data, but hopefully the supply-increasing theme is the more recent emerging theme that will be more dominant in the future.

The Future Shortages of Poultry Veterinarians

After rating demand and supply related factors, panel members were asked the “most likely” estimate of the percent that the future available supply veterinarians would differ from the expected demand over various time periods (i.e., the expected average percentage surplus or shortage of poultry practice veterinarians). As is the case with the demand estimates, 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. 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 50th 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. As was the case with the demand estimates, the presence of a few extreme outliers in the distribution were reviewed and eliminated in calculating statistics. For example, one panelist projected a 7% surplus in the long-term time frame. This was over double the next most extreme estimate of a 3% surplus. Extreme values, particularly in relatively small Delphi panels, make the means less representative of the panel and need to be removed from the analysis.

Figure 8

Short-Term Shortages (2004-07)

2nd Survey Results:

- Mid-50% = -1.0% to +1.0%
- Mean = -0.3% (■)
- Median = 0% (▲)

3rd Survey Results:

- Mid-50% = -1.0% to +1.0%
- Mean = +0.2% (■)
- Median = 0% (▲)

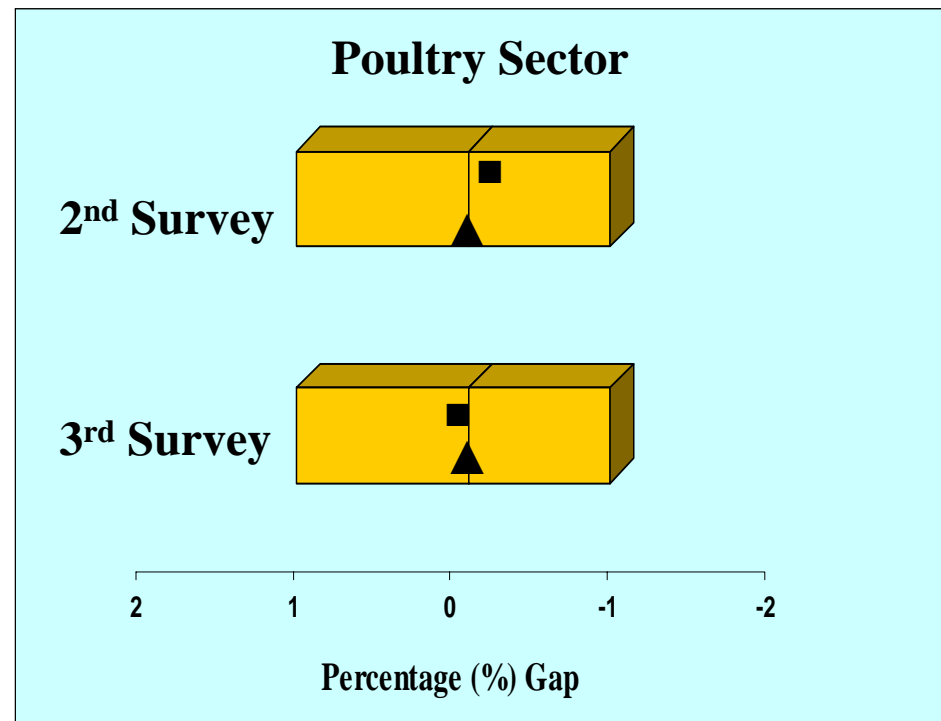


Figure 9

Medium-Term Shortages (2007-10)

2nd Survey Results:

- Mid-50% = 0% to -1.8%
- Mean = -0.6% (■)
- Median = 0% (▲)

3rd Survey Results:

- Mid-50% = 0% to -1.0%
- Mean = -0.2% (■)
- Median = 0% (▲)

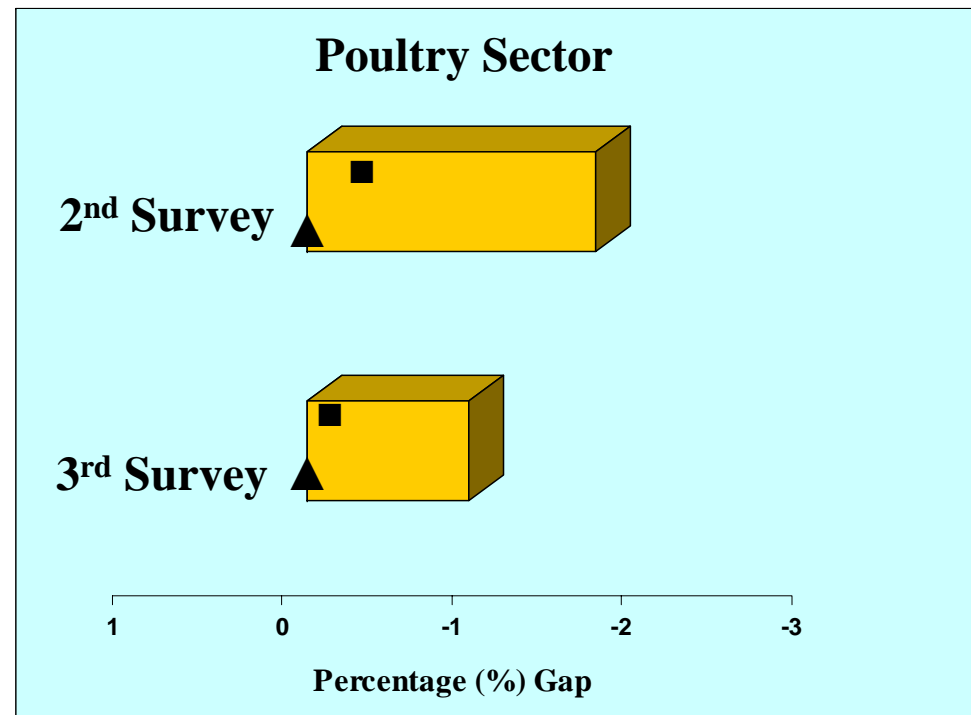


Figure 10

Long-Term Shortages (2010-16)

2nd Survey Results:

- Mid-50% = 0% to -1.9%
- Mean = -0.6% (■)
- Median = 0% (▲)

3rd Survey Results:

- Mid-50% = 0% to -1.0%
- Mean = -.1% (■)
- Median = 0% (▲)

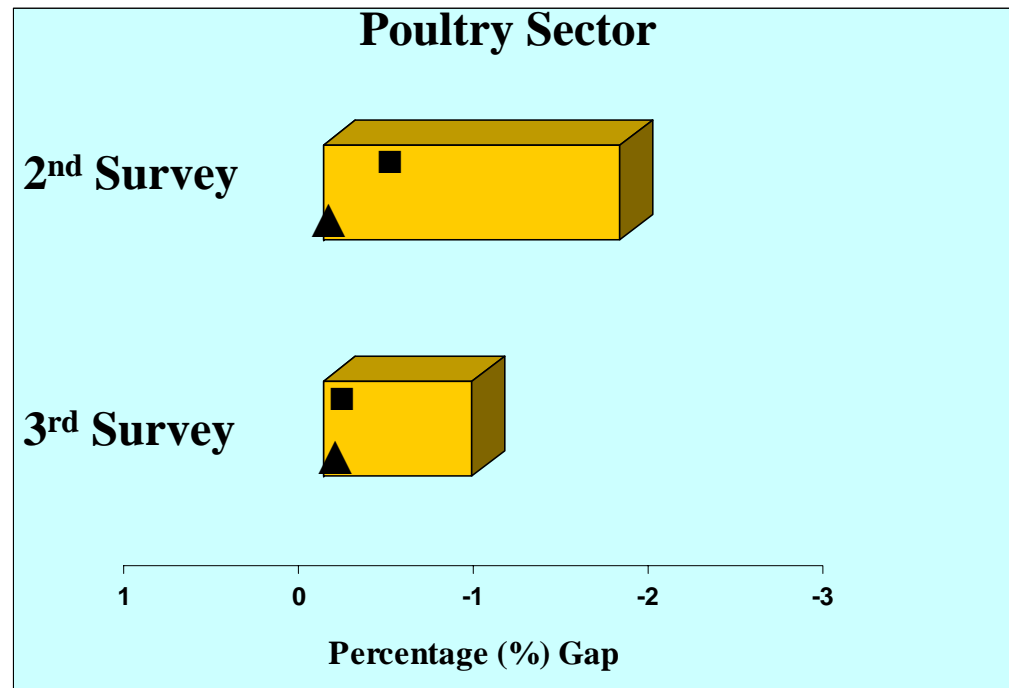


Figure 11

Future Shortages Summary

Short-Term (2004-07):

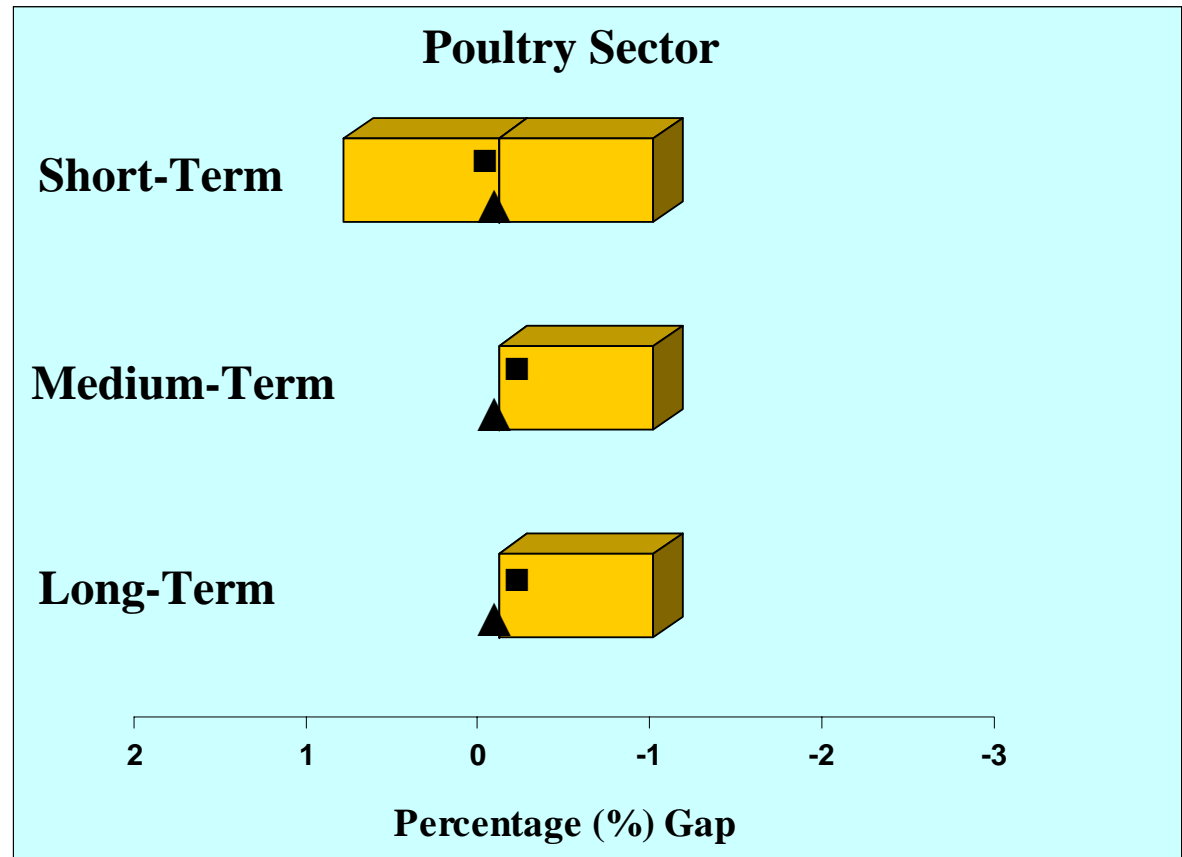
- Mid-50% = +1.0% to -1.0%
- Mean = +0.2% (■)
- Median = 0% (▲)

Medium-Term (2007-10):

- Mid-50% = 0% to -1.0%
- Mean = -0.2% (■)
- Median = 0% (▲)

Long-Term (2010-16):

- Mid-50% = 0% to -1.0%
- Mean = -.1% (■)
- Median = 0% (▲)



As noted in the figures, the middle 50% of the panel always included zero in their estimate of the future shortage/surplus of food supply veterinarians in poultry practice. Those ranges are quite narrow and were either (1) 0% to -1%, which indicates a good match between supply and demand to a slight shortage, or (2) +1% to -1%, which indicates a slight surplus to a slight shortage. The median scores are always zero and the mean score departs only marginally from zero. This adds up to a strong consensus that, while very modest increases in demand may occur, there will be a near match between the poultry veterinarians available to meet the demands for their services over the next several years. Self-rated experts made significantly different estimates compared to their less-expert counterparts in the long-run (2010-2016) forecast. Experts forecasted a slight surplus (+.3%) and the less-expert sub-group estimated a slight shortage (-.6). This result does not change the overall conclusion of a close match of supply and demand.

Solutions for the Future Shortage of Poultry Veterinarians

The final question addresses: 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? For all panels, 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 7 on the 7-point rating scale indicates that a solution would be “highly effective” at *eliminating* the expected shortage. In many panels, there was a pattern of shortages. Given that this is not the case for the poultry sector, this question was logically less relevant to the poultry panel members and their ratings should be interpreted in that light. However, including the results for this panel provides completeness and comparability to the results in other panels. The mean is the arithmetic average for poultry panel members. The following are the solutions that are rated above the mid-point of the scale. These are listed in order of the rated effectiveness in eliminating shortages:

1. Mentoring initiatives for students and those starting a food supply career (mean of 5.07 on a 7-point scale)¹⁰
Note that self-rated experts (mean: 5.83) saw this as a more effective solution than less-expert raters (mean: 4.50)

¹⁰ 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.

2. Expanded paid work-study programs during the final year of the DVM programs (mean of 5.07)
3. More involvement of food supply practitioners in training veterinary students (mean of 5.07)
4. Increased focus of food supply coverage early in the DVM curriculum (mean of 5.00)
5. Focused recruitment of high school and college students with food supply interests into veterinary colleges (mean of 4.79)
6. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities (mean of 4.64)
7. Reserve class slots for academically qualified students with food supply interests and relevant background (mean of 4.57)
8. Appointment of more food supply faculty at colleges of veterinary medicine (mean of 4.47)
9. Paid externship requirement in food supply medicine during the summer (mean of 4.43)
10. Student debt repayment and scholarship programs for service in areas of need (mean of 4.38)
11. Expanded postgraduate fellowships in food supply areas (mean of 4.38)
12. Provide expanded job placement services in the food supply veterinary medicine areas (mean of 4.33)
13. Expand the Centers of Excellence concept with a nationally recognized focus on different food supply sectors (mean: 4.07)

These items represent possible tactics that can be a part of a larger strategy for dealing with future shortages. Collectively, these could be elements of a strategy focused on increasing interest of pre-veterinary students in FSVM careers (items 5 and 6) and making sure that academically qualified food animal oriented students are admitted to a veterinary school (see item 7). Once these food animal oriented students are in school,

crafting their development in this field is key (see items 2, 3, 4, 8, and 9). As they approach graduation, facilitating their entry into FSVM career positions (see items 1, 10, 11, and 12) will place them in food animal careers. Once they enter career positions helping them adjusting to the career realities of these position (see item 1) will help them perform well and increase the likelihood of staying in the FSVM occupational area. The appointment of more food supply faculty (see item 8) along with curricular changes will facilitate students getting more early exposure to food supply careers (see item 4). Using more practitioners (see item 8) could augment scarce faculty resource to help educate students. Items 2, 9, and 11 are educational strategies for giving students more hands-on FSVM work experiences during their training. Besides helping students develop skills in this area, externships and postgraduate fellowships also provide bridges to post-graduation FSVM jobs. This lessens the likelihood of being attracted to alternative employment opportunities. The Centers of Excellence concept (see item 13) is a large scale strategy that that could build in a number of other higher rated solutions and could provide a critical infrastructure for delivering more hands-on experience, obtaining more faculty resources to teach them, and attracting more students.

Conclusion: Stay the Course

The data from this study reveals a clear future pattern of modest increases in demand and a close match between the likely available supply of poultry veterinarians relative to their expected demand. This sector is in relatively good shape for providing the needed animal health, food safety, and related public health services into the foreseeable future. These estimates are based on the assumption that present trends will continue and that there will not be major catastrophic events. A major disease outbreak and other shocks could change the expected balance between supply and demand. In a globally integrated food supply system, there will always be these risks.

The planning matrix presented with several analyses provides guidance on the opportunities and constraints that must be considered in addressing ways to fine-tune and improve the poultry FSVM sector. Many of the themes noted on Figures 2 and 7 are also noted in other sectors. Leadership is needed to organize collective action. This should include the actionable opportunities noted in those figures. The poultry area may be a beneficiary of collective action in the profession even if their needs are much less pressing compared to other sectors. The identified solutions provide a starting point for developing effective elements to an effective coherent strategy of collective action.

Supplemental Information

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

1. Temporary links to the three the poultry 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 poultry Delphi panel:
 - a. First Survey: <http://survey.cba.ksu.edu/prince/poultry1/index.htm>
 - b. Second Survey: <http://survey.cba.ksu.edu/prince/poultry2/index.htm>
 - c. Third Survey: <http://survey.cba.ksu.edu/prince/poultry3/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 Poultry Delphi panel.

Exhibit A

Poultry Delphi Panel Members¹

- | | |
|----------------------|------------------------|
| 1. Richard Chin | 13. Patrick Pilkington |
| 2. James Dawe | 14. Stewart Ritchie |
| 3. Patty Dunn | 15. Steve Roney |
| 4. Richard Dutton | 16. Mariano Salem |
| 5. Eric Gonder | 17. Rick Sharpton |
| 6. Frederic J. Hoerr | 18. John A. Smith |
| 7. Chuck Hofacre | 19. Daniel Venne |
| 8. Eric Jensen | 20. Lloyd Weber |
| 9. Kenton Kreager | 21. Robert Williams |
| 10. David J. Mills | 22. Helen Wojcinski |
| 11. Raul Otalora | 23. Eric Gingerich |
| 12. Bob Owen | |

¹ Note that not all panel members completed all three surveys. These individuals originally agreed to participate.

Exhibit B

Poultry Panel 1st Survey Interim Feedback Report

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

This report identifies a few key patterns and more specific information from the 1st survey is included in the 2nd survey. Questions with more disagreement are repeated in the 2nd survey and panel averages and the ranges of the middle 50% of replies (between the 25% and 75% percentiles) are noted. 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 1st 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 2nd survey (“Move to larger sized producer operations”) has the following notation:

“1st Survey: Average = 4.2 & Mid-50% = 3 to 5; CDN = 5.6 & US = 3.8; Experts = 4.8 (vs. 3.6)”

This indicates that the mean of the panel was 4.2 on a 7-point scale (just above “4. No Influence”) and the middle-50% of panelists (between the 25th and 75th percentiles) rated it 3, 4 or 5 (between “3. Slight Decrease” and “5. Slight Increase”). Canadian members saw this factor as having a positive influence on demand (mean = 5.6 on the 7-point scale) and US members saw a more neutral to negative influence (mean = 3.8, just below “4. No Influence”). Self-rated “experts” had a significantly higher mean rating (mean = 4.8) than the “less-expert” group mean of 3.6. (This means that experts saw moving to larger sized operations as a more positive and less negative factor compared to those less confident in their forecasts.) Statistical information from the 1st survey will be presented in this format throughout the 2nd survey.

Please review this feedback before (or as) you complete the 2nd survey.

I. Factors Influencing Demand for Food Supply Veterinarians in Poultry Careers

The first section in the 1st 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
- Zoonotic disease-related human health concerns
- Increasing concern for animal welfare
- Required 3rd-party certification or verification of standards
- Increasing concerns for animal health

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

- Curtailment of government support of veterinary services
- Client concerns about veterinary service costs
- Federal and/or State/Provincial budgetary constraints
- Lack of veterinarian's practice management & business skills

II. Future Demand Estimates for Poultry Food Supply Veterinarians

The mean value for the general forecast of future demand for the 1st survey is 4.4 (between “4. Stay Exactly the Same” and “5. Increase Slightly”). The middle 50% (25th to 75th percentile) rated demand as 4 or 5. 54% of the panel selected “5. Increase Slightly”. There were no differences in self-rated experts vs. less-expert or Canadian vs. US contrasts. (See question #3 in the 2nd survey.)

Additional questions asked for the “most likely” range of changes in future demand for several time periods. The mid-point of panelist's range estimates was used to calculate estimates. For the four time periods starting in the fall of 2005, the panel saw average demand increases between 1% to 2% and the middle 50% estimates ranged between 0% and less than 3%. Just under a third saw no change or falling demand, and over two-thirds saw raising demand. For the current time period (fall of 2004 to fall of 2005), over 40% saw no change in demand.

Panel members seeing *stronger* future demand (compared to those seeing *weaker* demand) rated the following “demand influences” (from question #1 in the 1st survey) as having significantly *more positive (or less negative)* influences on demand:

- Client concerns for about veterinary service costs
- Zoonotic disease-related human health concerns
- Use of non-DVMs, such as veterinary technicians

Those rating themselves as more “expert” (versus “less-expert”) tended to see more increasing demand (but this difference was not statistically strong, so it should be interpreted cautiously). The few Canadians in this panel tended to see higher increasing demand, but the difference was also not statistically strong.

III. Factors Influencing the Supply for Poultry Food Supply Veterinarians

The more extreme negative influences on the future supply for poultry veterinarians (low ratings on the question #10 items from the 1st survey) are:

- Less emphasis on food animal practice in veterinary colleges
- Little exposure to food supply career options in college

- Lack of spousal career options in rural areas
- Limited life style and career opportunities in rural areas
- Lack of food supply practice-related externships for students

IV. Projected Shortage or Surplus of Poultry Food Supply Veterinarians

The panel sees a fairly close match between the supply and demand for DVMs in the poultry area. Over half marked “4. Very Close Match” on the general question asking them to estimate the degree of surplus vs. shortage over the next 12 years. Additional questions asked for the “most likely” range of changes in future demand for several time periods. The mid-point of the panelists’ range estimates was used to calculate the panel average. The most frequently given estimate of shortage vs. surplus over all time periods was zero (no shortage or surplus) and the mean value was always very close to zero. There were no differences on contrasts in expert versus less-expert. Canadian estimates tended to see small shortages while the US members tended to see surpluses; however, these differences were not statistically strong.

Next Steps...

The patterns that are starting to emerge tell an interesting story for DVMs in poultry careers. It is one that is different from what I am seeing in other panels! Your replies to the second survey will add and clarify this story more.

Thank you for your continuing help and involvement!

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May 25, 2005

Exhibit C

Poultry Panel 2nd Survey Interim Feedback Report

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

This report is formatted similarly to the 1st survey feedback report. It identifies a few key patterns and directs you to more specific information incorporated into the 3rd survey. Questions where there was more disagreement are repeated in the 3rd survey and panel averages and the ranges of the middle 50% of replies (between the 25% and 75% percentiles) are noted. 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 1st survey) versus those rating themselves as “less expert” in making forecasts, then those contrasts are noted. There are not enough continuing Canadian members to reliably create contrasts with US members. So unique Canadian patterns are not reported. For example, item #1 in the first section of the 3rd survey (“Increasing concern for animal welfare”) has the following notation:

“2nd Survey: Average = 5.3 & Mid-50% = 5 to 6; Experts = 6.0 (vs. 4.9)”

This indicates that the mean of the panel was 5.3 on a 7-point scale (above “5. Slight Increase”) and the middle-50% of panelists (between the 25th and 75th percentiles) rated it 5 or 6 (between “5. Slight Increase and “6. Increase”). Self-rated “experts” made significantly higher ratings (mean = 6.0/7) compared to the “less expert” subgroup (mean = 4.9/7). Statistical information from the 2nd survey will be presented in this format throughout the 3rd survey.

Please review this feedback before (or as) you complete the 3rd survey.

V. Factors Influencing Demand for Veterinarians in Poultry Careers

The first section in the 1st 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 2nd survey. The top-rated influences seen as *increasing* future demand from both surveys are:

- Public concerns over food safety
- Increased auditing of animal welfare
- Increased governmental regulation of programs and requirements
- Zoonotic disease-related human health concerns
- Export regulation and international trade-related requirements

- Required 3rd-party certification or verification of standards

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

- Governmental budget and program cut-backs
- Curtailment of government support of veterinary services
- Mergers between firms within the poultry industry
- Low profit margins in the poultry industry
- Client concerns about veterinary service costs
- Availability of drugs not requiring veterinary oversight

VI. Future Demand Estimates for Poultry Veterinarians

The average value for the general forecast of future demand for the 2nd survey is 4.3 on the 7-point scale (just above “4. Stay Exactly the Same”). (See question 3 in the 3rd survey.) 50% marked “5. Increase Slightly” and 35% marked “4. Stay Exactly the Same”. The middle 50% (25th to 75th percentile) marked one of these two choices (4 or 5).

Additional questions asked for the “most likely” estimate of changes in future demand for several time periods. The panel average was always positive and projected demand beyond 2005 to be +1% for each time period. The middle 50% estimated future demand to be in the 0% to +2.8% (increase) range.

Panel members seeing *higher than average increasing demand* (compared to those seeing decreasing demand or lower increasing demand) rated the following “demand influences” (from question 1 in the 1st survey) as having a significantly *more positive* (or *less negative*) influence on demand:

- Client concerns about veterinary service costs
- Zoonotic disease-related human health concerns
- Use of non-DVMs, such as veterinary technicians

From the demand influence evaluated in the 2nd survey, the following patterns distinguished those seeing *higher than average increasing demand*. First, they were *less* concerned about the negative influence of the “Availability of drugs not requiring veterinary oversight” and “Low profit margins in the poultry industry” on DVM demand. Second, they rated “Need to understand animal-human health ecosystems” and “Managerial job opportunities in the food companies” as having a *higher* positive influence on future DVM demand.

The 2nd survey evaluated several skill and activity areas suggested in the 1st survey comments where there will be higher or lower demand relative to the general pattern in poultry veterinary medicine. Two areas of clear *decreasing* demand noted are:

“Technical service activities supporting vaccines and pharmaceuticals” and “Diagnostic services.” Activities where there is the highest *increasing* demand are:

- Food safety related activities
- Animal welfare related activities
- Governmental regulatory activities
- Activities related to export & international trade regulations

VII. Factors Influencing the Supply for Poultry Veterinarians

Factors influencing the supply of DVMs entering Poultry careers were evaluated in both prior surveys (see question 7, 3rd survey). The more extreme *negative influences* on the future supply for Poultry food supply veterinarians noted in the 1st and 2nd surveys are:

- Less emphasis on food animal practice in veterinary colleges
- Little exposure to food supply career options in college
- Fewer entering DVM students with agricultural backgrounds
- Federal and/or State/Provincial budgetary constraints

The 2nd survey evaluated several supply-influences drawn from comments to the 1st survey. The highest rated *positive* supply influences identified are:

- Good income opportunities in the poultry area
- Good poultry area externship opportunities and student mentoring
- Predictable work hours & few emergency call demands
- Expected high number of food supply veterinarians retiring in the near future
- Availability of post-DVM poultry-related training opportunities

VIII. Projected Shortage or Surplus of Poultry Veterinarians

The panel on average sees a very slight shortage or a close match between the modest increase in future demand and future supply of poultry veterinarians. In the general question on whether there will be a surplus or shortage (see question 9 in the 3rd survey), 65% marked “4. Very Close Match” and the mean was 4.1/7. Specific estimates of the shortage or surplus of Poultry DVMs over several time periods (see #10 in the 3rd survey) present a clear pattern of agreement that there will be no shortage or a slight shortage of -1.0% to -2.0% over several periods. The middle 50% of estimates always included 0% (no surplus or shortage).

Next Steps...

The patterns flagged in the 1st survey have become clearer in the 2nd survey. This presents a unique and interesting story for DVMs in poultry 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, those of you who see at least a slight shortage problem will have an opportunity to evaluate several possible solutions.

Thank you for your continuing help and involvement!

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July 11th, 2005

Exhibit D

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

Survey Item	Survey Wave ¹²	% Decrease ¹³	% No Influence	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Public concern over food Safety	1 st	0	0	100	5.9	.63	5.5 to 6	21
2. Use of non-DVMs, such as veterinary technicians	1 st	27.8	50	22.2	4.0	1.24	3 to 4.3	18
2. Use of non-DVMs, such as veterinary technicians	2 nd	42.1	42.1	15.8	3.8	1.23	3 to 4	19
2. Use of non-DVMs, such as veterinary technicians	3 rd	33.3	66.7	0	3.7	.49	3 to 4	18
3. Public concern over bio-terrorism	1 st	0	33.3	66.7	4.9	.83	4 to 5	21
4. Zoonotic disease-related human health concerns	1 st	0	9.5	90.5	5.4	.81	5 to 6	21
5. Required third party certification or verification of standards	1 st	0	9.5	90.5	5.2	.70	5 to 6	21
6. Limited public understanding of food quality and safety issues	1 st	10	50	40	4.5	.95	4 to 5	20
7. More meat consumption in the US and Canada	1 st	0	44.4	55.6	4.6	.61	4 to 5	18
8. More access to global markets for food exports	1 st	5	5	90	5.0	.65	5 to 5	20
9. Changing dietary habits in third-world countries	1 st	0	42.9	57.1	4.9	.91	4 to 5.5	21
10. Need to protect indigenous wildlife from exotic diseases	1 st	0	78.9	21.1	4.4	.90	4 to 4	19
10. Need to protect indigenous wildlife from exotic diseases	2 nd	0	66.7	33.3	4.5	.86	4 to 5	18
11. Federal and/or state/provincial budgetary constraints	1 st	57.9	21.1	21.1	3.6	1.01	3 to 4	19
11. Federal and/or state/provincial budgetary constraints	2 nd	60	10	30	3.8	1.02	3 to 5	20
11. Federal and/or state/provincial budgetary constraints	3 rd	52.6	36.8	10.6	3.6	.83	3 to 4	19
12. Curtailment of government support of veterinary services	1 st	73.7	10.5	15.8	3.3	1.11	3 to 4	19
13. Increasing concern for animal wildlife	1 st	4.8	14.3	81	5.2	1.17	5 to 6	21
13. Increasing concern for animal wildlife	2 nd	10.5	5.3	84.2	5.3	1.25	5 to 6	19
13. Increasing concern for animal wildlife	3 rd	0	5.3	94.7	5.6	.83	5 to 6	19
14. Increasing concern for animal health	1 st	0	20	80	5.2	.83	5 to 6	20
15. Need to understand animal-human health eco-systems	1 st	0	45	55	4.8	.79	4 to 5	20
15. Need to understand animal-human health eco-systems	2 nd	5.6	38.9	55.6	4.7	.90	4 to 5.3	18

¹² The “1st” refers to the 1st Delphi survey. The “2nd” refers to the 2nd Delphi survey, while the “3rd” refers to the 3rd Delphi survey.

¹³ 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.

16. Availability of highly technical or specialized services	1 st	5.9	35.3	58.8	4.8	1.03	4 to 5	17
16. Availability of highly technical or specialized services	2 nd	5.3	21.1	73.7	5.0	.85	4 to 6	19
17. Veterinary services agreements required for agri-business loans	1 st	0	60	40	4.6	.91	4 to 5	15
18. Growing need to track animals entering the food chain	1 st	0	47.6	52.4	4.9	1.01	4 to 5.5	21
18. Growing need to track animals entering the food chain	2 nd	0	45	55	4.9	.97	4 to 6	20
19. Constraints on non-DVMs giving prescription drugs	1 st	0	40	60	5.0	1.00	4 to 5.8	20
19. Constraints on non-DVMs giving prescription drugs	2 nd	0	30	70	5.0	.92	4 to 5	20
20. Slow adoption of new technologies by veterinarians	1 st	25	66.7	8.3	3.8	.75	3.3 to 4	12
21. Move to larger sized producer operations	1 st	52.4	9.5	38.1	4.0	1.56	3 to 5	21
21. Move to larger sized producer operations	2 nd	60	5	35	3.7	1.30	3 to 5	20
21. Move to larger sized producer operations	3 rd	63.2	10.5	26.3	3.6	1.26	3 to 5	19
22. Client use of veterinary herd management services	1 st	14.3	28.6	57.1	4.3	1.14	4 to 5	14
23. Client concerns about veterinary service costs	1 st	50	43.8	6.3	3.4	.89	3 to 4	16
24. Lack of veterinarian's practice management and business skill	1 st	29.4	70.6	0	3.6	.71	3 to 4	17
25. Part-time farmers needing more veterinary services	1 st	7.7	53.8	38.5	4.3	.63	4 to 5	13
56. Increased governmental regulatory programs and requirements	2 nd	0	5	95	5.7	.81	5 to 6	20
57. Increased auditing of animal welfare	2 nd	0	0	100	5.8	.70	5 to 6	20
58. Export regulation and international trade-related requirements	2 nd	0	20	80	5.4	.94	5 to 6	20
59. New drugs coming to market that require veterinary oversight	2 nd	10	10	80	4.9	1.18	5 to 5	20
59. New drugs coming to market that require veterinary oversight	3 rd	11.8	47.1	41.2	4.4	1.12	4 to 5	17
60. Managerial job opportunities in food companies	2 nd	10	10	80	5.0	.89	5 to 5.8	20
61. Low profit margins in the poultry industry	2 nd	63.2	31.6	5.3	3.4	.68	3 to 4	19
62. Governmental budget and program cut-backs	2 nd	75	25	0	3.2	.59	3 to 3.8	20
63. Mergers between firms within the poultry industry	2 nd	65	20	15	3.3	.98	3 to 4	20
64. Availability of drugs not requiring veterinary oversight	2 nd	35	65	0	3.6	.69	3 to 4	20

Section II. Specialized Activities Increasing or Decreasing in Demand Relative to the General Pattern (Poultry FSVM Careers)

Survey Item	Survey Wave	% Lower ¹⁴	% No Difference	% Higher	Mean	Standard Deviation	Middle 50% Range	N
1. Animal welfare related activities	2 nd	0	0	100	5.8	.72	5 to 6	20
2. Food safety related activities	2 nd	0	0	100	6.0	.51	6 to 6	20
3. Governmental regulatory activities	2 nd	5	5	90	5.5	.95	5 to 6	20
4. Prescription writing	2 nd	5	50	45	4.6	1.05	4 to 5	20
5. Jobs in public service roles	2 nd	5	40	55	4.7	.87	4 to 5	20
6. Expertise in exotic and foreign diseases	2 nd	10.5	26.3	63.2	4.8	1.03	4 to 5	19
7. Activities related to export and international trade regulations	2 nd	0	25	75	5.0	.80	4.3 to 5	20
8. Production medicine roles	2 nd	20	55	25	4.1	.79	4 to 4.8	20
9. Technical service activities supporting vaccines and pharmaceuticals	2 nd	42.1	47.4	10.5	3.5	.91	3 to 4	19
10. Diagnostic services	2 nd	20	70	10	4.0	.69	4 to 4	20

¹⁴ 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 Poultry FSVM Careers

Survey Item	Survey Wave	% Decrease ¹⁵	% No Influence	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Less emphasis on food animal practice in veterinary colleges	1 st	100	0	0	2.4	.67	2 to 3	20
2. More women veterinarians entering the workforce	1 st	42.9	47.6	9.5	3.3	1.19	2 to 4	21
2. More women veterinarians entering the workforce	2 nd	15	75	10	3.9	.85	4 to 4	20
3. Physical demands of large animal veterinary work	1 st	23.5	76.5	0	3.7	.59	3.5 to 4	17
4. Need to work long hours and emergency calls	1 st	36.8	63.2	0	3.6	.61	3 to 4	19
5. Little exposure to food supply career options in college	1 st	95	5	0	2.7	.59	2 to 3	20
6. Lack of food supply practice-related externships for students	1 st	61.1	38.9	0	3.3	.67	3 to 4	18
7. Lack of positive role models in veterinary food supply practice	1 st	66.7	26.7	6.7	3.1	.96	2 to 4	15
7. Lack of positive role models in veterinary food supply practice	2 nd	50	50	0	3.4	.72	3 to 4	16
8. Poor income opportunities in rural areas	1 st	46.2	53.8	0	3.2	1.01	2.5 to 4	13
8. Poor income opportunities in rural areas	2 nd	57.1	35.7	7.1	3.2	1.25	2 to 4	14
8. Poor income opportunities in rural areas	3 rd	21.4	57.1	21.4	4.0	.96	3.8 to 4.3	14
9. Lack of cultural and recreational opportunities in rural areas	1 st	35.3	58.8	5.9	3.7	.59	3 to 4	17
10. Lack of spousal career options in rural areas	1 st	50	44.4	5.6	3.6	.86	3 to 4	18
11. Limited lifestyle and career opportunities in rural areas	1 st	38.9	50	11.1	3.8	.81	3 to 4	18
12. Federal and/or state/provincial budgetary constraints	1 st	78.9	15.8	5.3	3.1	.99	3 to 3	19
12. Federal and/or state/provincial budgetary constraints	2 nd	78.9	21.1	0	3.1	.57	3 to 3	19
13. High debt load of veterinary school graduates	1 st	45	40	15	3.5	1.28	3 to 4	20
13. High debt load of veterinary school graduates	2 nd	55	25	20	3.5	1.10	3 to 4	20
13. High debt load of veterinary school graduates	3 rd	42.2	47.4	10.5	3.5	.96	3 to 4	19
14. Expected high number of food supply veterinarians retiring in the near future	1 st	31.6	26.3	42.1	4.1	1.43	3 to 5	19
14. Expected high number of food supply veterinarians retiring in the near future	2 nd	10	35	55	4.5	.76	4 to 5	20
14. Expected high number of food supply veterinarians retiring in the near future	3 rd	15.8	21.1	63.2	4.4	1.12	4 to 5	19

¹⁵ 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 st	35.3	64.7	0	3.6	.62	3 to 4	17
16. Perceived lack of demand for food animals	1 st	62.5	37.5	0	3.1	.81	2.3 to 4	16
17. Requirement for education beyond a DVM	1 st	45	50	5	3.4	.88	3 to 4	20
38. Increasing acceptance of foreign-trained veterinarians	2 nd	35	30	35	4.1	1.17	3 to 5	20
39. Availability of post-DVM poultry-related training opportunities	2 nd	15	30	55	4.5	.83	4 to 5	20
40. Predictable work hours and few emergency call demands	2 nd	0	30	70	4.8	.62	4 to 5	20
41. Good income opportunities in the poultry area	2 nd	0	10.5	89.5	5.3	.75	5 to 6	19
42. Good poultry area externship opportunities and student mentoring	2 nd	5	5	90	5.2	.75	5 to 6	20
43. Fewer entering DVM students with agricultural backgrounds	2 nd	60	35	5	3.1	1.10	2 to 4	20
43. Fewer entering DVM students with agricultural backgrounds	3 rd	63.2	31.6	5.3	3.3	.95	3 to 4	19
44. Required training beyond the DVM to enter the poultry area	2 nd	30	60	10	3.8	.72	3 to 4	20
45. Animal rights campaigns aimed at veterinary students	2 nd	57.9	31.6	10.5	3.3	1.00	3 to 4	19
45. Animal rights campaigns aimed at veterinary students	3 rd	63.2	31.6	5.3	3.4	.84	3 to 4	19

Section IV. Solutions for Shortages in the Poultry Sector

Survey Item	Survey Wave	% Less Effective ¹⁶	% 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 rd	14.2	71.5	14.2	4.6	1.22	4 to 5	14
2. Expand the Centers for Excellence concept where nationally recognized focus on different food supply sectors	3 rd	40	46.7	13.4	4.1	1.44	3 to 5	15
3. Focused recruitment of high school and college students with food supply interests into veterinary colleges	3 rd	21.4	57.1	21.4	4.8	1.19	3.8 to 5.3	14
4. Increased focus of food supply coverage early in DVM curriculum	3 rd	20	40	40	5.0	1.65	4 to 6	15
5. Expanded business and practice management coverage in DVM curriculum	3 rd	60	26.6	13.4	3.4	1.72	2 to 5	15
6. Expanded postgraduate fellowships in food supply areas	3 rd	23.1	61.6	15.4	4.4	1.45	3.5 to 5	13
7. Expanded paid work-study programs during the final year of DVM	3 rd	7.1	64.3	28.5	5.1	1.00	4.8 to 6	14
8. More involvement of food supply practitioners in training veterinary students	3 rd	13.3	43.3	33.3	5.1	1.22	4 to 6	15
9. Provide expanded job placement services in the food supply veterinary medicine areas	3 rd	20	66.7	13.3	4.3	1.23	4 to 5	15
10. Appointment of more food supply faculty at colleges of veterinary medicine	3 rd	20	60	20	4.5	1.30	4 to 5	15
11. Paid externship requirement in food supply medicine during the summer	3 rd	21.4	50	28.6	4.4	1.65	3.5 to 6	14
12. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities	3 rd	21.4	50	28.5	4.6	1.55	3.8 to 6	14
13. Student debt repayment and scholarship programs for service in food supply areas of need	3 rd	46.2	15.4	38.5	4.4	1.85	3 to 6	13

¹⁶ 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.”

14. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities	3 rd	61.6	38.5	0	2.6	1.50	1 to 4	13
15. Low cost (subsidized) consulting in business and practice management for new food supply DVMs	3 rd	64.3	35.7	0	2.6	1.45	1 to 4	14
16. Mentoring initiatives for students and those starting a food supply career	3 rd	14.3	35.7	50	5.1	1.49	4 to 6.3	14
17. Focused recruitment of women students in food supply areas	3 rd	58.3	33.3	8.3	3.3	1.49	2.3 to 4	12
18. Development and dissemination of Business Best Practices for food supply veterinary enterprises	3 rd	69.3	23.1	7.1	2.7	1.75	1 to 4	13