
Chapter 9

The Future Demand for Food Supply Veterinarians in Small Ruminant Careers

Table of Contents

Introduction.....	3
The Delphi Forecasting Technique.....	4
Issues and Trends Driving Future Demand for Food Supply Veterinarians in Small Ruminant Careers.....	8
The Future Demand for Food Supply Veterinarian Small Ruminant Careers	17
Specialized Activities Increasing or Decreasing in Demand.....	24
Trends and Issues Driving the Future Supply of Food Supply Veterinarians in Small Ruminant Careers	26
The Future Shortages of Food Supply Veterinarians in Small Ruminant Careers	33
Solutions for the Future Shortage of Food Supply Veterinarians in Small Ruminant Careers	40
Conclusion: A General Need for Action.....	43
Supplemental Information.....	45

Introduction

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

- I. What are the issues and trends likely to drive the future demand for food supply veterinarians in small ruminant practices?
- II. Assuming a continuation of currently unfolding trends and the absence of major catastrophic events, what will be the demand for food supply veterinarians in the small ruminant area 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 small ruminant food supply area?
- IV. What are the issues and trends likely to drive the future supply of food supply veterinarians entering careers in the small ruminant area?
- 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 small ruminant food supply veterinarians over the next several years?
- VI. Given the answers to the first five questions, how can leaders in the small ruminant area 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

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 method¹ 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,

¹ 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.

and Food Safety & Security), Canadian Federal Government Service, Industrial 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 veterinarians in the small ruminant area 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 25th and 75th 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 Food Supply Veterinarians in Small Ruminant Careers

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 small ruminant sector. Sixteen additional items were derived from those open-ended comments for a total of 41 items. In the second survey, the additional 16 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)²:

Trends Increasing Demand

1. Increasing concern for animal health (7.00 on a 7-point scale)³
2. Zoonotic disease-related human health concerns (mean: 7.00)
3. Part-time farmers needing more veterinary services (mean: 6.81)
4. Public concerns over food safety (mean: 6.81)
5. Demand for “farm-to-fork” accountability and tracking (mean: 6.77)

² Where significant differences ($p < .10$) exist between the ratings of the self-rated forecasting experts' sub-group versus the less-expert sub-group exist, those respective means are noted. Given the sample size, differences had to be quite extreme to reach statistical significance. There was too few panel members focused on the Canadian context to provide a meaningful contrast with US-focused panel members.

³ 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.

6. Increasing need for disease and food-borne illness monitoring (mean: 6.77)
7. Interest in locally-produced high quality meats (mean: 6.77)
8. Growing need to track animals entering the food chain (mean: 6.77)
9. Availability of highly technical or specialized services (mean: 6.63)
10. Client use of veterinary herd management services (mean: 6.60)
11. Required third party certification or verification of standards (mean: 6.60)
12. Growth in “ethnic” meat market (mean: 6.54)
13. Growth of smaller farms and hobby farm segment (mean: 6.54)
14. Small ruminants being treated as pets and high care expectations (mean: 6.50)
15. Increasing concern for animal welfare (mean: 6.40)
16. Demand for reproduction and genetics expertise (mean: 6.31)
17. Demand for herd health services (mean: 6.31)
18. General lack of available small ruminants expertise (mean: 6.25)
19. More access to global markets for food exports (mean: 6.25)

Note that items with a mean rating of 4.0 to 6.2 (between the “4. No Influence” and “6. 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 1st, 2nd, or 3rd 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 small ruminant sector starting with the most influential factors first:

Trends Decreasing Demand

1. Producers' low profit margins and market volatility (mean: 2.15)⁴
2. Client concerns about veterinary service costs (mean: 2.29)
3. Lack of veterinarian's practice management and business skill (mean: 2.40)
4. Availability of OCT pharmaceuticals and biologicals without veterinary oversight (mean: 2.62)
5. Curtailment of government support of veterinary services (mean: 2.75)
6. Urbanization and loss of farm/agricultural land (mean: 3.08)
7. Federal and/or State/Provincial budgetary constraints (mean: 3.14)
8. Use of non-DVMs, such as veterinary technicians (mean: 3.31)
Note that the self-rated forecasting experts' sub-group mean of 4.43 is significantly higher than the less-expert sub-group mean of 2.20.
9. Urbanization and loss of farm/agricultural land (mean: 3.31)
10. Slow adoption of new technologies by veterinarians (mean: 3.50)

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 FSVM profession, such as governments, is needed to change the expected pattern of influence on future demand.

⁴ 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.

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 10 Trend Decreasing Demand items noted above all map to the left-side of Figure 1. Figure 2 captures the themes evident in those results. For example, items 1 (Producers’ low profit margins and market volatility), 2 (client cost concerns) and 8 (use of non-DVMs, such as veterinary technicians) identify the *Cost Pressures & Market Volatility* theme noted in the lower-left quadrant of Figure 2. Item 4 (availability of OTC pharmaceuticals) is an additional consequences of this trend. Producers will likely continue to look for less expensive alternatives, such as searching for labor substitutes and trying to get veterinary medical services without the higher cost of a veterinarian. These constraints are based on larger economic forces and, as such, are not highly actionable or subject to change. Changing this larger trend would require cooperation with external entities, including governments. While this trend needs to be considered and managed around in planning strategic action, other areas avail themselves to direct strategic action. Likely strategic responses will need to react to this trend and better demonstrate the value-added beyond the cost of service.

Figure 1 Planning Matrix

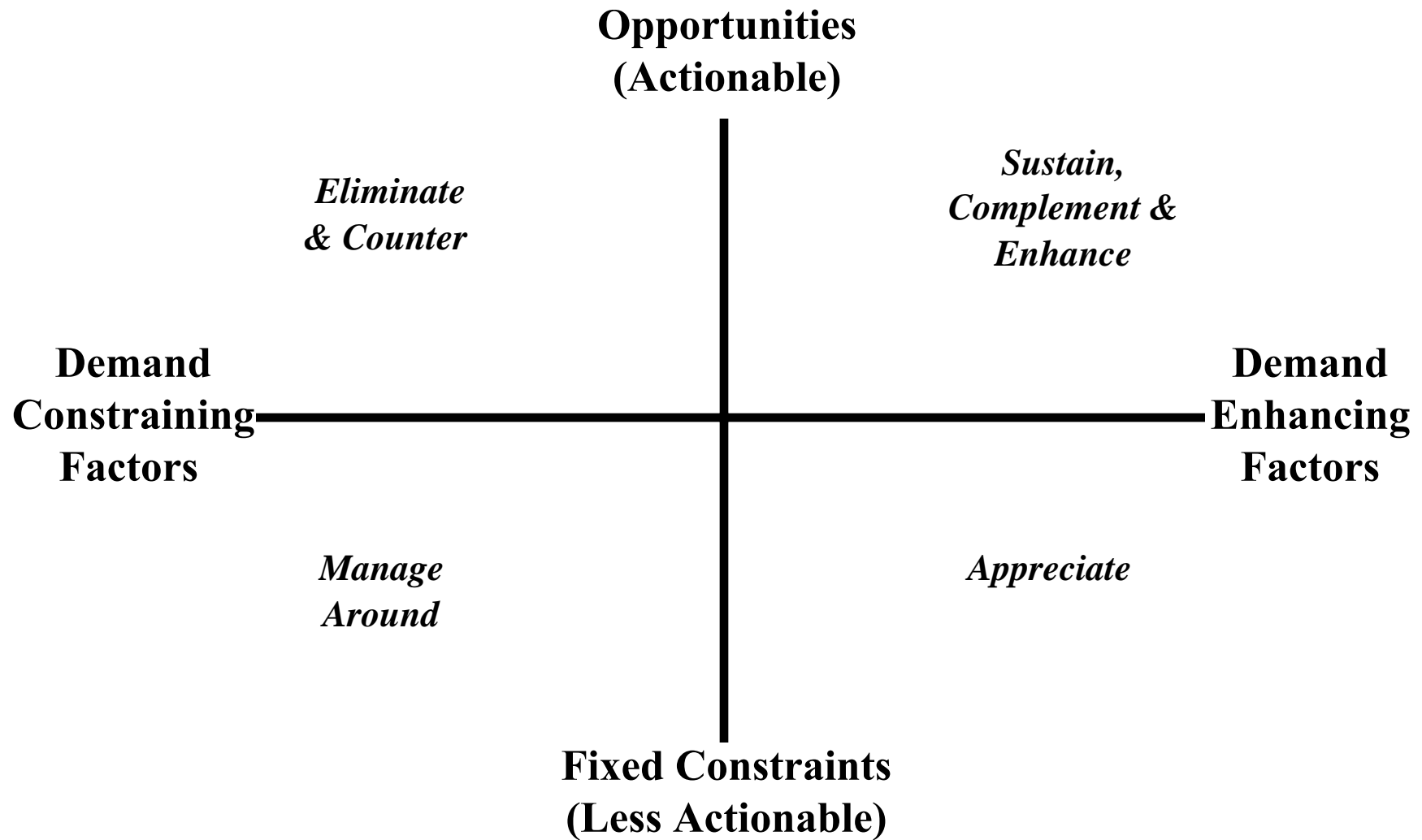
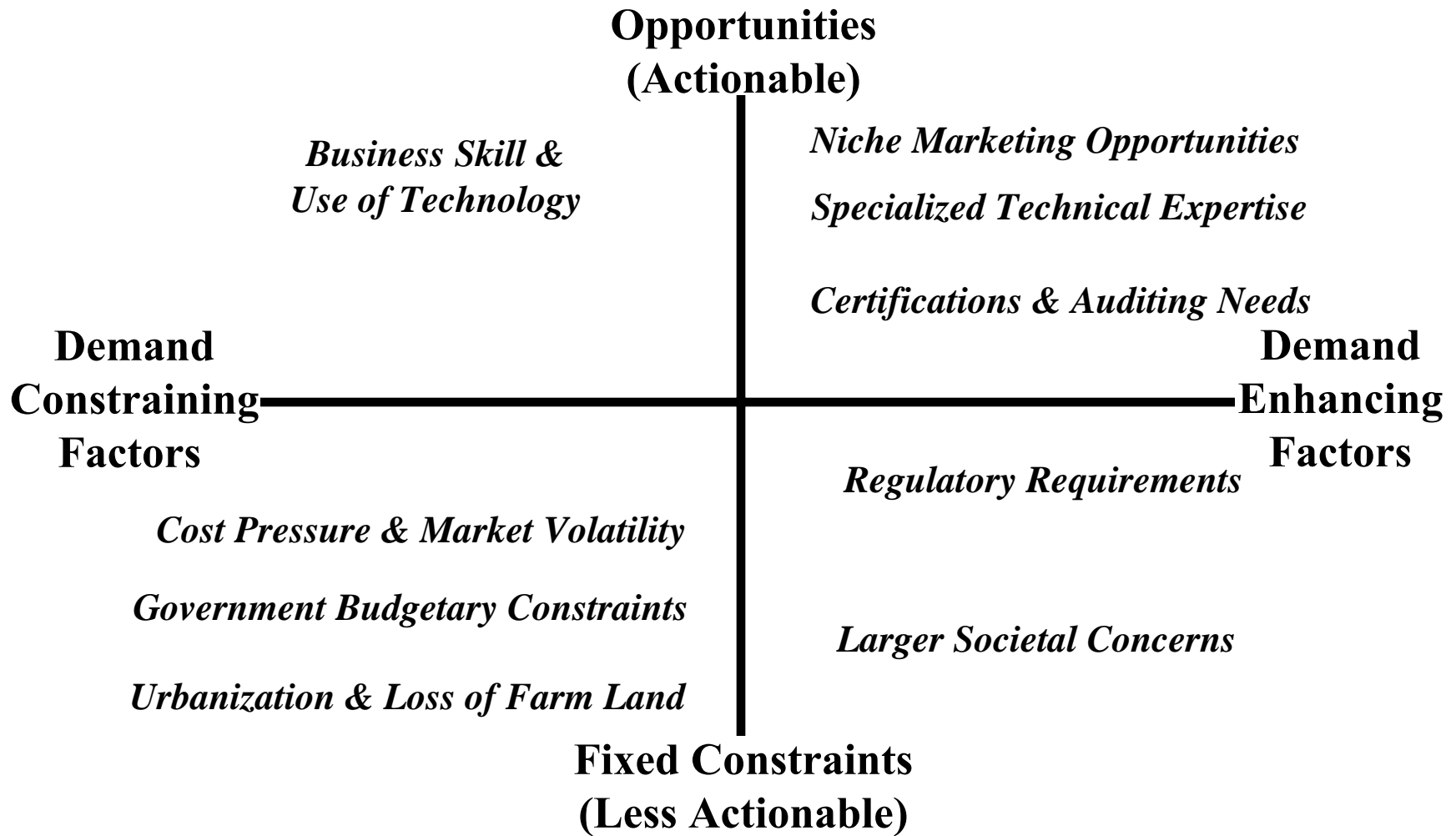


Figure 2

Demand Diminishing & Enhancing Issues in the Small Ruminant Sector



Two additional themes are noted in the lower-left quadrant of Figure 2. *Government Budgetary Constraints* is supported by two items that have also been noted in the results of other panels: item 5 (Curtailment of government support) and item 7 (Federal and/or State/Provincial budgetary constraints). The *Urbanization & Loss of Farm Land* theme is flagged by item 6 (urbanization and loss of farm/agriculture land). Both of these themes are constraints that must be managed around. Strategic actions must consider and respond to these trends, but will not likely alter these underlying trends in a substantial way.

The upper-left quadrant presents a theme that can be changed through strategic actions. Items 3 (lack of veterinarians' practice management and business skills) and item 10 (slow adoptions of new technologies by veterinarians) identifies the *Business Skill & Use of Technology* theme. While all major changes can be challenging, this theme is much more actionable. The FSVM profession and the veterinary colleges that provide training to students and continuing education to practicing veterinarians need to review and determine what actions are needed to change this demand constraining trend. There are exemplary practices that can serve as models for others. Educational initiatives that expand the use of key management and appropriate technology usage practices are needed to counter this trend. While external resources are always beneficial, the change process can be started with internal resources by those within the FSVM profession. Commitment and the development of a consensus on the need for change is the key factor inhibiting constraint. This theme has been noted in most other FSVM sectors. It is not unique to veterinary medicine in small ruminants.

The listing of the 19 demand-increasing items summarized above as “Trends Increasing Demand” all map to the right-side of the planning matrix. This is a fairly long list with ratings that are high (indicating stronger influences on demand). Note that in several other panels a “5. Slight Increase” was the normal cut-off for the increasing demand list, but in this panel a 6.20 cut-off still produced 19 items. This means that there are several useful points of strategic leverage for the small ruminant sector. Several highly rated items relate to larger societal concerns. This is noted as the *Larger Societal Concerns* theme. Items that support this theme include: item 1 (concern for animal health), item 2 (zoonotic disease-related human health), item 4 (food safety concerns), and item 15 (animal welfare concerns). These items have long been demand factors for the profession, but have become larger issues in the public eye in recent years. The high means indicated on the first three items denote that these are strong influences. However, these are not factors that are easily changed by strategic actions in the profession, but they should be appreciated in the strategic planning process. The *Larger Societal Concerns* theme is noted in the lower-right quadrant of the Figure 2 planning matrix.

An additional theme also noted in the lower-right quadrant is *Regulatory Requirements*. Item 5 relates to “farm-to-fork” accountability and tracking requirements and additional related items include: item 6 (disease and food-borne illness monitoring), item 8 (growing need to track animals entering the food change), and 19 (more access to global markets). FSVM professionals in this sector should appreciate the increasing-demand of this factor in their planning processes even though it is a less-actionable constraint that will not easily be changed through strategic action.

Several of the items in the “increasing demand trends” listing are more actionable and are noted in the upper-right quadrant. A theme that is very unique to the small ruminant sector is *Niche Market Opportunities*. This is supported by item 3 (Part-time farmers needing services), item 7 (interest in locally-produced high quality meats), item 12 (growth in “ethnic” meat market), item 13 (growth in smaller farmers and hobby farm segment), and item 14 (small ruminants being treated as pets and high care expectations). This theme is noted in the upper-right quadrant and is likely the most actionable demand-increasing opportunity available to FSVM professionals in this sector. *Specialized Technical Expertise* is a related theme and it is illustrated by items 9 (availability of highly technical or specialized services), 10 (client use of veterinary or specialized services), 16 (reproduction and genetics expertise), and 17 (herd health services). The last theme in the upper-right quadrant is *Certifications & Auditing Needs* and this is supported by item 11 (third party certification or verification of standards).

The Future Demand for Food Supply Veterinarians in Small Ruminant Careers

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, with the accompanying feedback report on the second survey results, was additional opportunities 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 (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 provide the results of each time period. Figure 6 provides a summary of the results of the final survey for all three time periods.

Figure 3

Short-Term Demand Change (2004-07)

2nd Survey Results:

- Mid-50% = +1.0% to +5.0%
- Mean = +1.6% (■)
- Median = +3.0% (▲)

3rd Survey Results:

- Mid-50% = +1.0% to +5.0%
- Mean = +3.2% (■)
- Median = +3.0% (▲)

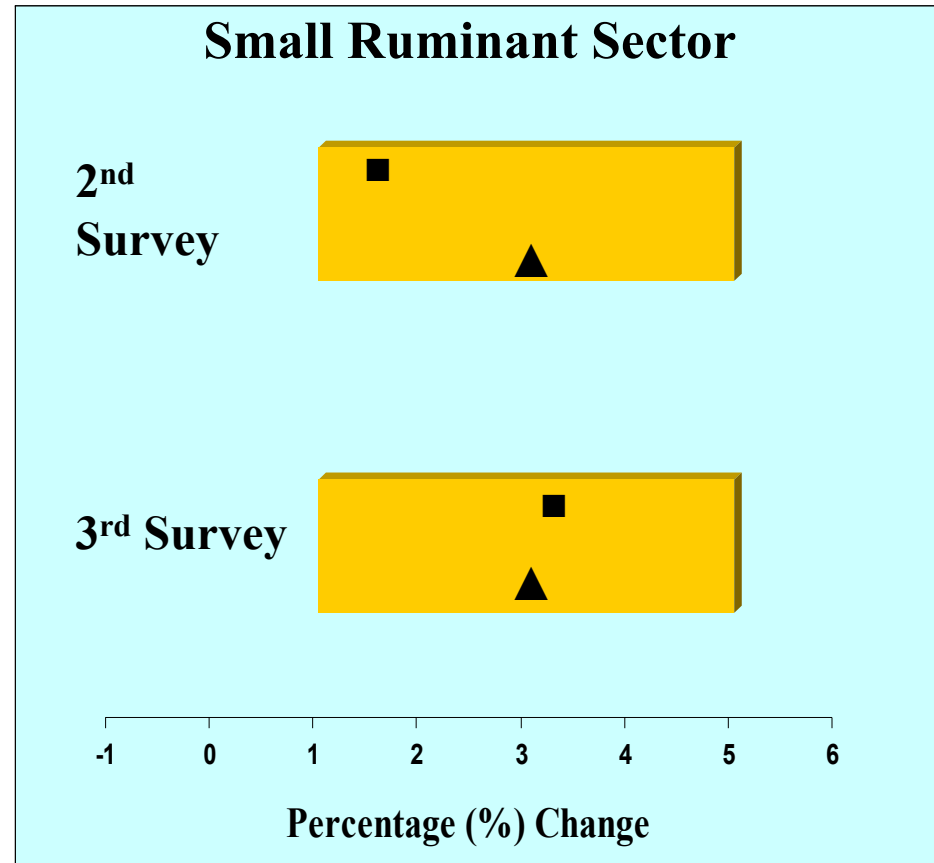


Figure 4

Medium-Term Demand Change (2007-10)

2nd Survey Results:

- Mid-50%: 0% to +4.0%
- Mean = +1.5% (■)
- Median = +2.0% (▲)

3rd Survey Results:

- Mid-50%: +1.0% to +3.8%
- Mean = +2.3% (■)
- Median = +2.0% (▲)

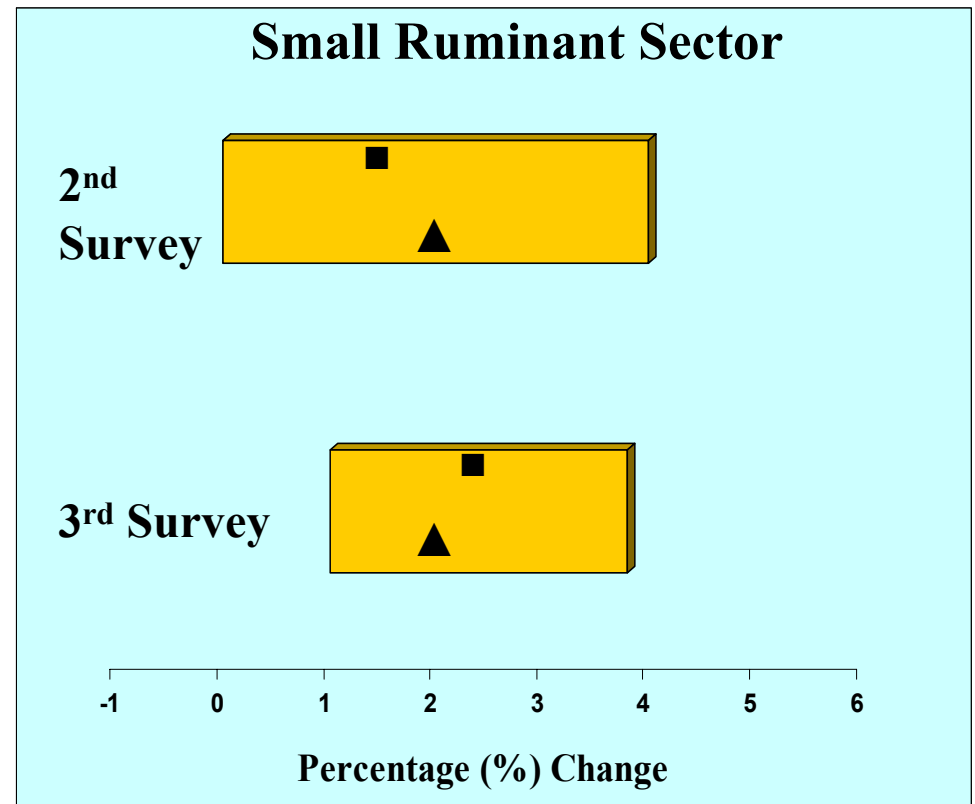


Figure 5

Long-Term Demand Change (2010-16)

2nd Survey Results:

- Mid-50%: 0% to +5.0%
- Mean = +1.1% (■)
- Median = +2.0% (▲)

3rd Survey Results:

- Mid-50%: 0% to +4.0%
- Mean = +2.4% (■)
- Median = +2.0% (▲)

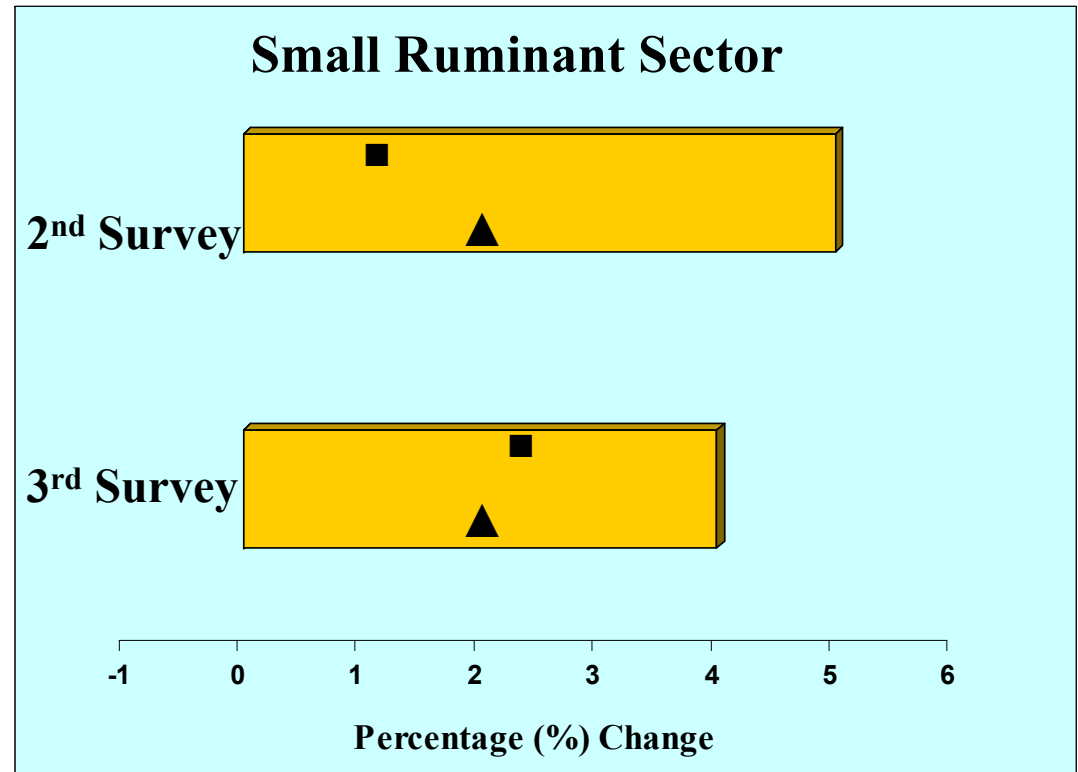


Figure 6

Future Demand Summary

Short-Term (2004-07):

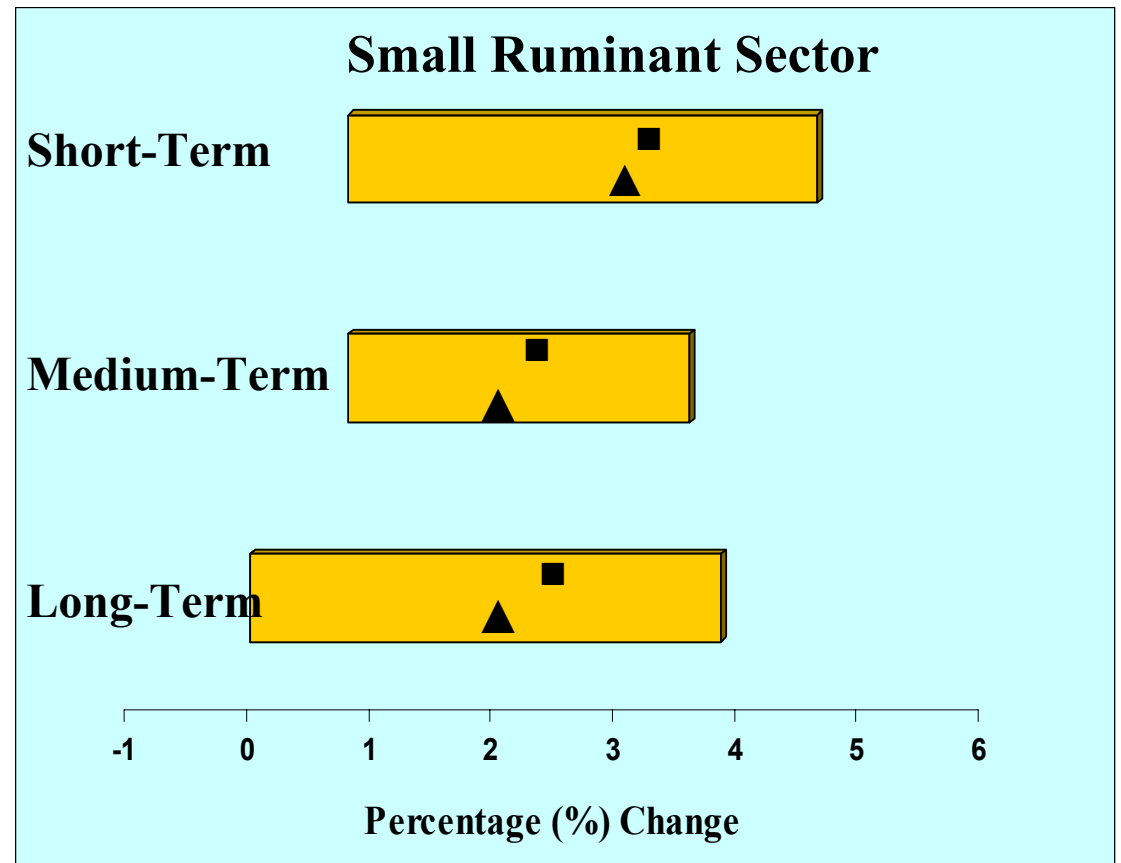
- Mid-50% = +1.0% to +5.0%
- Mean = +3.2% (■)
- Median = +3.0% (▲)

Medium-Term (2007-10):

- Mid-50%: +1.0% to +3.8%
- Mean = +2.3% (■)
- Median = +2.0% (▲)

Long-term (2010-16):

- Mid-50%: 0% to +4.0%
- Mean = +2.4% (■)
- Median = +2.0% (▲)



There is a general consensus that demand is increasing. The middle 50% of the panel sometimes included zero on the low-end (25th percentile rating), but most of the middle 50% range was in the positive range, predicting demand increases up to 4.0% to 5.0% over all three time periods in the final survey. The point estimates seen in the means and median scores varied between +1.1% and +3.0%. On the critical final survey round, the point estimates were between +2.0% to +3.2%. While there was general agreement that demand will increase at a modest rate, there remained after the final Delphi round, some disagreement on the exact extent that demand is expected to increase. Further analysis was done to evaluate the basis for these differing perceptions within the panel.

The sub-group analysis based on self-rated forecasting expertise found that while experts forecasted higher demand than the less-expert sub-group in all but one contrast, these differences also did not reach statistical significance. The fairly small sample size and the wide variance within each sub-group lessen the likelihood of a statistically significant difference even when the difference between means seemed fairly large. In the final survey, there were too few Canada-focused panelists to provide meaningful contrast with US-focused members.

Growing or Near-Zero Demand Increases

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. Those below the +2.4% overall median score for the three time periods combined had a sub-group median of +1.3% and those above the overall median had a sub-group median of +4.0%. The following

demand-influencing factor is seen by those projecting higher (versus near-zero) future demand growth as having significantly *higher* influence on demand:⁵

- More meat consumption in the US and Canada (mean is 6.00 in the higher demand sub-group vs. 4.50 in the near-zero demand growth sub-group)

Those seeing stronger increasing future demand also rated the following factor as significantly *lower* than the near-zero demand growth sub-group:

- Veterinary services agreements required for agri-business loans (4.75 in the higher demand sub-group vs. 6.57 in the near-zero demand growth sub-group)

Overall there was not a clear explanation as to the reasons for the differing view points seen at the extremes of the distribution. It should be noted, however, that compared to most panels, there is a fairly narrow range of estimates and a relative consensus of views in the small ruminant panel.

⁵ The scale introduced earlier should be used in interpreting the mean values for the growing vs. near-zero 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. The sub-groups were created by splitting the panel at the median (2.4%) on the average forecasted demand over all three time periods.

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 a substantial future increase or decrease in demand. These suggestions were content analyzed and 13 areas received multiple mentions. These were used to form items which panel members then rated in the second survey. The *higher-demand* activity areas (starting with the highest rated areas) are:

1. Telephone or on-line consultation (mean: 6.54 on a 7-point scale)⁶
2. Client educational activities (mean: 6.54)
3. Diagnosis and control of reportable diseases (mean: 6.54)
4. Reproduction related services (mean: 6.08)
5. Delivery of herd health management programs (mean: 6.08)
6. “Pet” type services (mean: 5.85)
7. 3rd party animal health certifications (mean: 5.75)
8. Herd nutrition consulting (mean: 5.62)
9. Routine services to hobby farmers and small producers (mean: 5.62)
10. Services focused on “exotic” small ruminants (mean: 5.38)
11. Emergency services (mean: 4.69)
12. Dispensing pharmaceuticals (mean: 4.23)
13. Individual sick animal care (mean: 4.00)

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.

None of the items were rated below the “4. No Difference” mid-point of the scale. The last two items (12 and 13) were suggested as decreasing demand activities, and a number of panel members rated those items as facing lower demand. However, several panel members also saw these areas as facing increasing demand, and the result was a mean very near the 4.0, which indicates no change in demand.

Figure 2 noted two actionable demand-enhancing strengths that small ruminant food supply veterinarians enjoy. They are the *Niche Marketing Opportunities* and *Specialized Technical Expertise* (from the upper-right quadrant). Several of the activity areas that are increasing in demand correspond to these themes and provide more details as to how these demand factors are playing out. Several of the items are examples of marketing to selected market niches. These include: item 6 (“pet” services), item 9 (services to hobby farmers), and item 10 (services focused on “exotic” small ruminants). Similarly, several items provide additional definition of *Specialized Technical Expertise* that is growing in demand. These include: item 3 (diagnosis and control of reportable diseases), item 4 (Reproduction related services), item 5 (delivery of herd health management programs), and item 8 (herd nutrition consulting). The two top rated items, item 1 (telephone or on-line consultation) and item 2 (client educational services) are more focused on the mode of delivery and are educational in nature. These activities involve veterinarians helping clients to be better informed and, at least sometimes, enabling the client to deliver the service.

Trends and Issues Driving the Future Supply of Food Supply Veterinarians in Small Ruminant Careers

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. Twelve 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 small ruminant food supply careers:

Trends Increasing Supply

1. More women veterinarians entering the workforce (mean: 6.77 on a 7-point scale)⁷
2. Ease of working with small ruminants versus large bovines (mean: 6.54)
3. Attractiveness of small ruminants to female veterinarians (mean: 6.31)
4. Growth in hobby farms (mean: 6.31)
5. Government support programs such as school loan repayment (mean: 5.15)
6. Mentoring and externship initiatives in this area (mean: 4.92)
Note that the self-rated forecasting experts' sub-group mean of 4.00 is significantly lower than the less-expert sub-group mean of 5.80.

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

The panel also identified several trends and factors that are reducing the supply of food supply veterinarians that are entering small ruminant careers. These are presented starting with the most extreme supply-decreasing factors first:

Trends Decreasing Supply

1. Need to work long hours and emergency calls (mean: 1.00)⁸
2. Poor income opportunities in food supply careers (mean: 1.00)
3. Less emphasis on food animal practice in veterinary colleges (mean: 1.00)
4. Lack of positive role models in veterinary food supply practice (mean: 1.20)
5. Little exposure to food supply career options in college (mean: 1.38)
6. High debt load of veterinary school graduates (mean: 1.38)
7. Perceived lack of demand for food animal skills (mean: 1.46)
8. Lack of spousal career options in rural areas (mean: 1.75)
9. Lack of supply practice-related externships for students (mean: 1.80)
10. Requirement for education beyond a DVM (mean: 2.00)
11. Selection of veterinary students without agriculture backgrounds (mean: 2.15)
12. Limited lifestyle and career opportunities in rural areas (mean: 2.38)
13. Expected high number of food supply veterinarians retiring in the near future (mean: 2.50)
14. Lack of cultural and recreational opportunities in rural areas (mean: 2.69)
15. Physical demands of large animal veterinary work (mean: 2.88)

⁸ The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future supply of dairy practice veterinarians. The mean rating for each item is noted in parentheses. The following scale anchor points will help in the interpretation of those means: 1. Strong Decrease, 2. Decrease, 3. Slight Decrease, 4. No Influence.

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. These items represent several different factors. The *Veterinary College Student Selection & Non-FSVM Focus* theme is noted by item 3 (less emphasis on food animal practice in veterinary colleges), item 5 (little exposure to food supply careers options in college), item 9 (lack of supply practice-related externships for students), and item 11 (selection of veterinary students with agriculture backgrounds). Also, item 7 (perceived lack of demand for food animal skills) is a likely consequence of informational cues sent to students that further illustrate the non-FSVM focus theme from faculty at veterinary colleges. This trend can be changed by better communication strategies and curricular changes. It is quite actionable simply with the coordination and cooperation of those within the FSVM profession and colleges of veterinary medicine. This theme is noted in the upper-left quadrant of Figure 7.

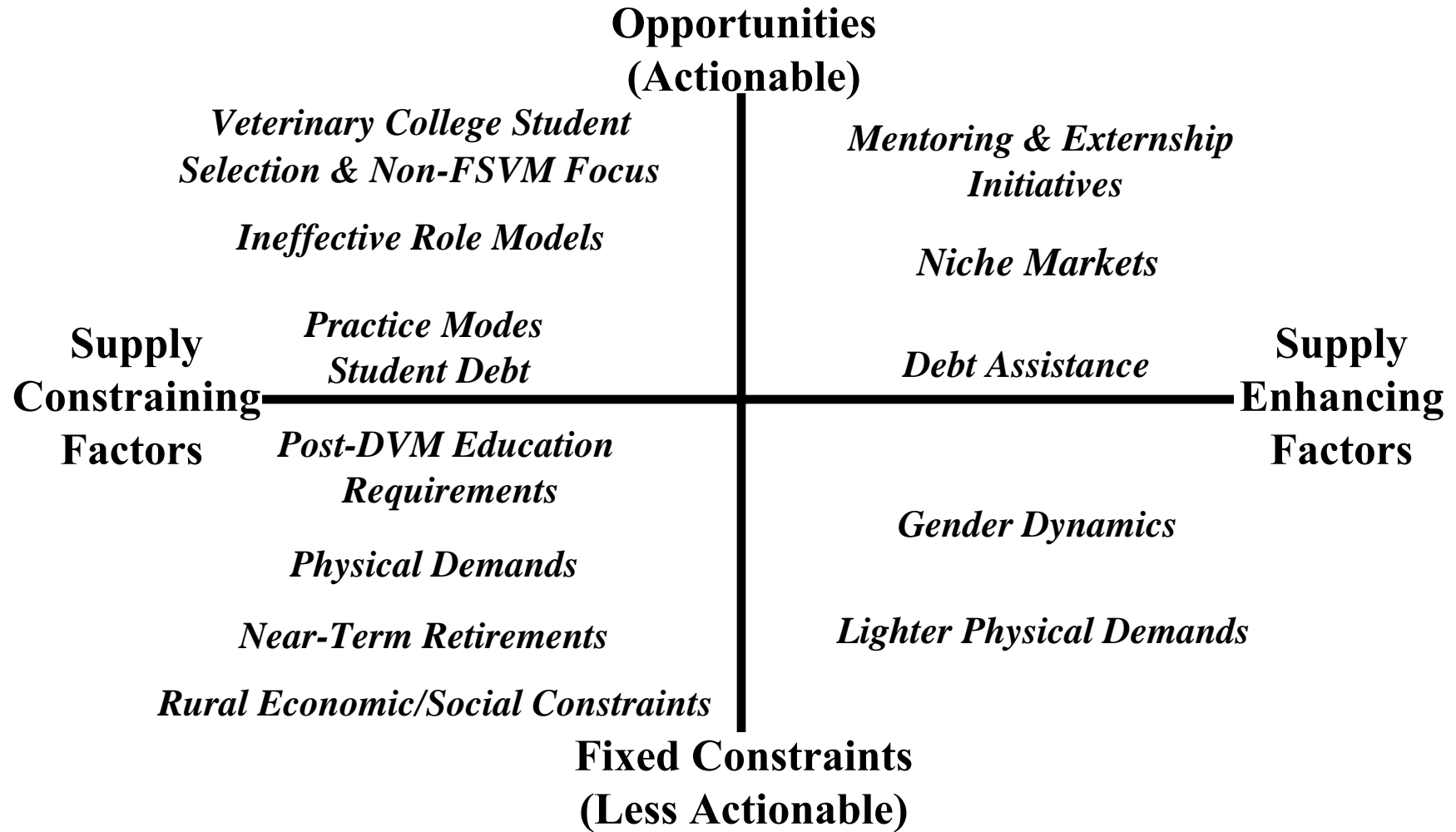
Additional themes seen as actionable opportunities are noted with fewer items, and these are all noted in the upper-left quadrant of Figure 7. An *Ineffective Role Models* theme has been noted in several FSVM sectors, including the small ruminant area. Item 4 (lack of positive role models in veterinary food supply practice) from the Trends Decreasing Supply listing identifies this theme. Coordinated efforts within the FSVM profession can change this trend. The highest rated of all supply decreasing trends is “need to work long hours and emergency calls” (item 1). While this factor is partially constrained by factors that will not change (such as animals getting sick at night), there

are opportunities to change the practice mode and develop other ways of organizing that will mitigate this problem. Practices that have developed better ways of organizing need to be identified and these “best practices” need to be communicated for all to benefit. Identifying better practices and ways of organizing should also help lessen the “poor income opportunities in food supply careers” supply constraint noted as item 2. This *Practice Mode* theme has been noted near the middle line of Figure 7 in recognition of the partial constraints on this actionable opportunity. *Student Debt* is noted as the final theme in the upper-left quadrant and it has also been placed near the middle line in recognition of constraints that will continue to impinge on any partial solutions to this problem. Item 6 (high debt load of veterinary school graduates) identifies this theme. Pattern of lower government support of higher education is well established and will not change any time soon. This will continue to push tuitions to higher, not lower, levels; however, there are both private and federal debt repayment schemes that can be further developed to partially offset this supply constraint.

Several items related to factors that are based on larger social and economic forces that will likely continue into the future. These less actionable or more fixed constraints need to be considered in any strategic planning process, and ways of managing around them must be developed to lessen their supply constraining influence. These themes are all noted in the lower-left quadrant of Figure 7. The *Rural Economic/Social Constraints* theme is identified by three related items: item 8 (lack of spousal career options in rural areas), item 12 (limited lifestyle and career opportunities in rural areas), and item 14 (lack of cultural and recreational opportunities in rural areas).

Figure 7

Supply Diminishing & Enhancing Issues in the Small Ruminant Sector



The other themes noted in the lower-left quadrant Figure 7 are all supported with single items. *Post-DVM Education Requirements* is identified by item 10 (requirement for education beyond a DVM). The *Physical Demands* theme is noted by item 15 (physical demands of large animal veterinary work). Logically, this should be less of a constraint in the small ruminant area. Finally, item 13 (expected high number of food supply veterinarians retiring in the near future) supports a *Near-Term Retirement* theme. The panel members were asked to rate this item (and other items) on the extent that it is resulting in a decrease or increase in the supply of new DVMs *entering* the small ruminant sector. While in some sectors the expected retirement bulge was seen as leading to more opportunities for new veterinarians entering a sector, this is not the case in this sector. It is quite possible that several panel members rated the effect of expected future retirement patterns on the *aggregate* supply of veterinarians in the small ruminant sector.

The six Trends Increasing Supply introduced on the first page of this section represent opportunities for promoting the profession and building on the generally good reputation food supply veterinarians enjoy in society. These six items all related to themes noted on the right (or Supply Enhancing) side of Figure 7. Items 1 (more women veterinarians entering the workforce) and item 3 (attractiveness of small ruminants to female veterinarians) identify a *Gender Dynamics* theme. The changing gender composition of the veterinary student population and the dramatic increase in the number of female veterinarians has been widely noted and is seen as an advantage in the small ruminant area. In several other sectors, this trend has been noted as a supply constraining factor. This trend is largely determined by social forces that are not directly actionable and, consequently, it has been placed in the lower-right quadrant of Figure 7. The *Lighter*

Physical Demands theme is a unique factor that is inherent in the demands of small ruminant work. This is noted in the lower-right quadrant. It is noted by item 2 (ease of working with small ruminant versus large bovines).

The other items in from the six supply increasing trends listing related to themes presented in the upper-left quadrant of Figure 7. *Debt Assistance* is noted by item 5 (government support of programs such as school loan repayment) and is placed next to the middle line in recognition of the limited extent that these government programs can be funded to fully address debt assistance needs. Nevertheless, efforts that expand this trend will have a useful impact. The *Niche Markets* theme is noted by item 4 (growth in hobby farms). This theme was also noted in Figure 2, and the rating here indicates that the panel sees it as both a demand and supply enhancing trend. *Mentoring & Externship Initiatives* is identified by item 6 (mentoring and externships initiatives in this area). These last two areas represent opportunities where leaders in the FSVM profession can develop commitment to programs that will extend the supply enhancing influence of these niche markets and mentoring and externships factors. This can be started without additional resources or the extensive involvement of external parties.

The Future Shortages of Food Supply Veterinarians in Small Ruminant Careers

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 the demand estimates, both the interquartile 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 time period. Figure 11 provides the summary of the projected shortages from the final survey for all three periods.

Figure 8

Short-Term Shortages (2004-07)

2nd Survey Results:

- Mid-50% = -1.5% to -3.0%
- Mean = -2.0% (■)
- Median = -1.8% (▲)

3rd Survey Results:

- Mid-50% = -1.3% to -3.0%
- Mean = -2.0%(■)
- Median = -2.0% (▲)

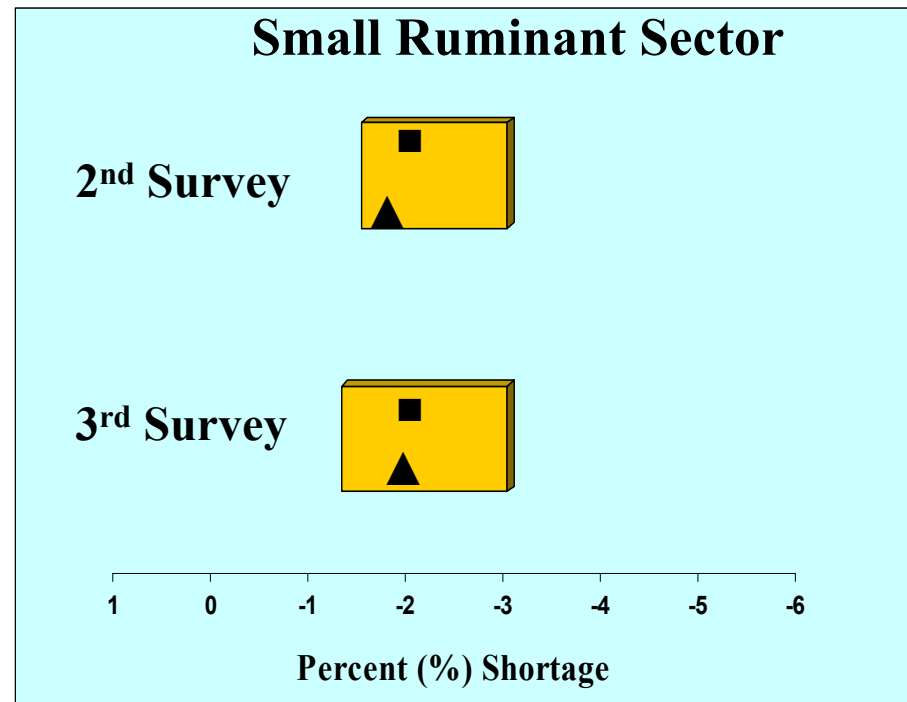


Figure 9

Medium-Term Shortages (2007-10)

2nd Survey Results:

- Mid-50% = -1.0% to -4.0%
- Mean = -2.8% (■)
- Median = -3.0% (▲)

3rd Survey Results:

- Mid-50% = -0.5% to -4.0%
- Mean = -2.4%(■)
- Median = -3.0% (▲)

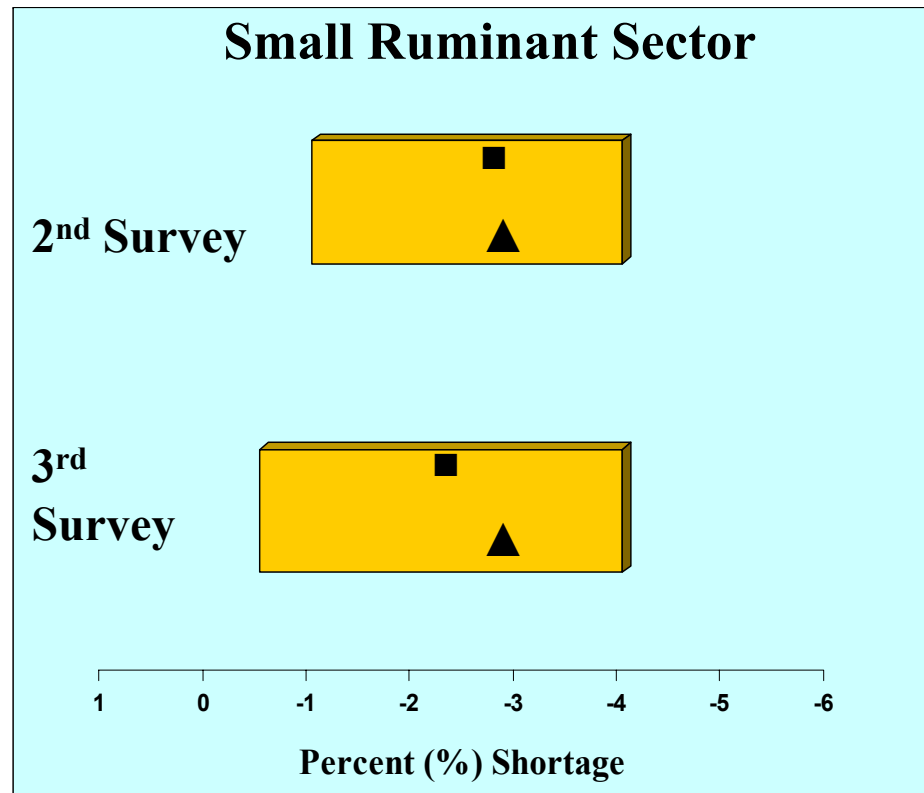


Figure 10

Long-Term Shortages (20010-16)

2nd Survey Results:

- Mid-50%: -0.6% to -5.0%
- Mean = -3.3% (■)
- Median = -3.0% (▲)

3rd Survey Results:

- Mid-50%: -0.5% to -4.3%
- Mean = -2.3% (■)
- Median = -2.0% (▲)

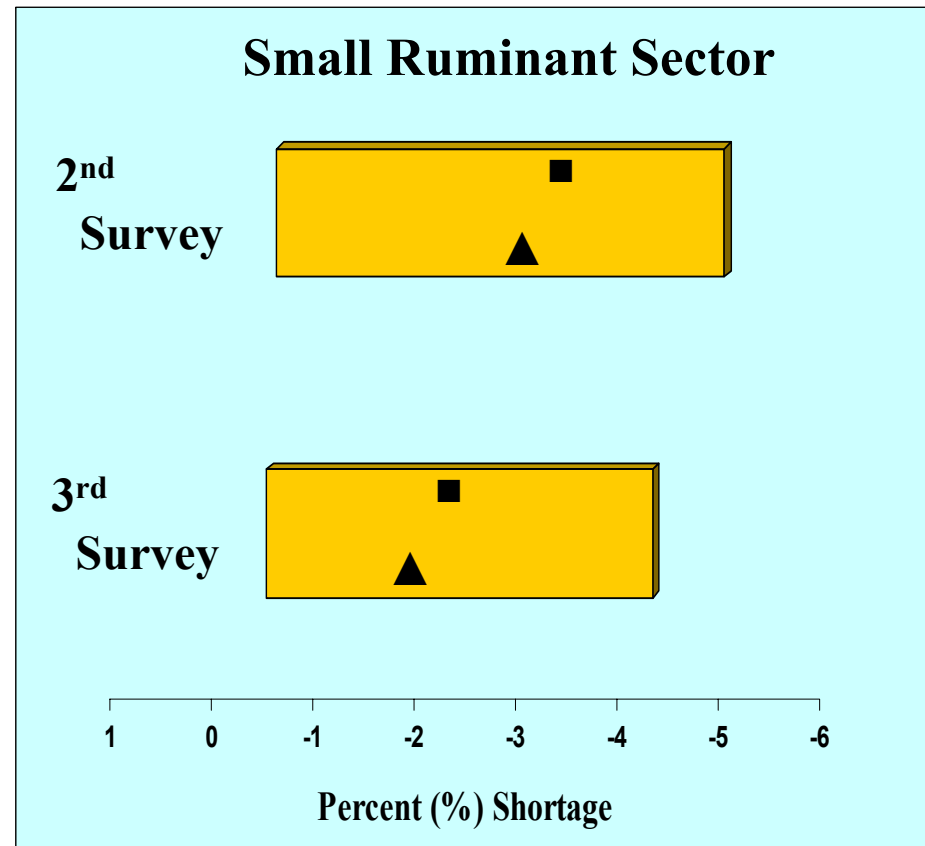


Figure 11

Future Shortages Summary

Short-Term (2004-07):

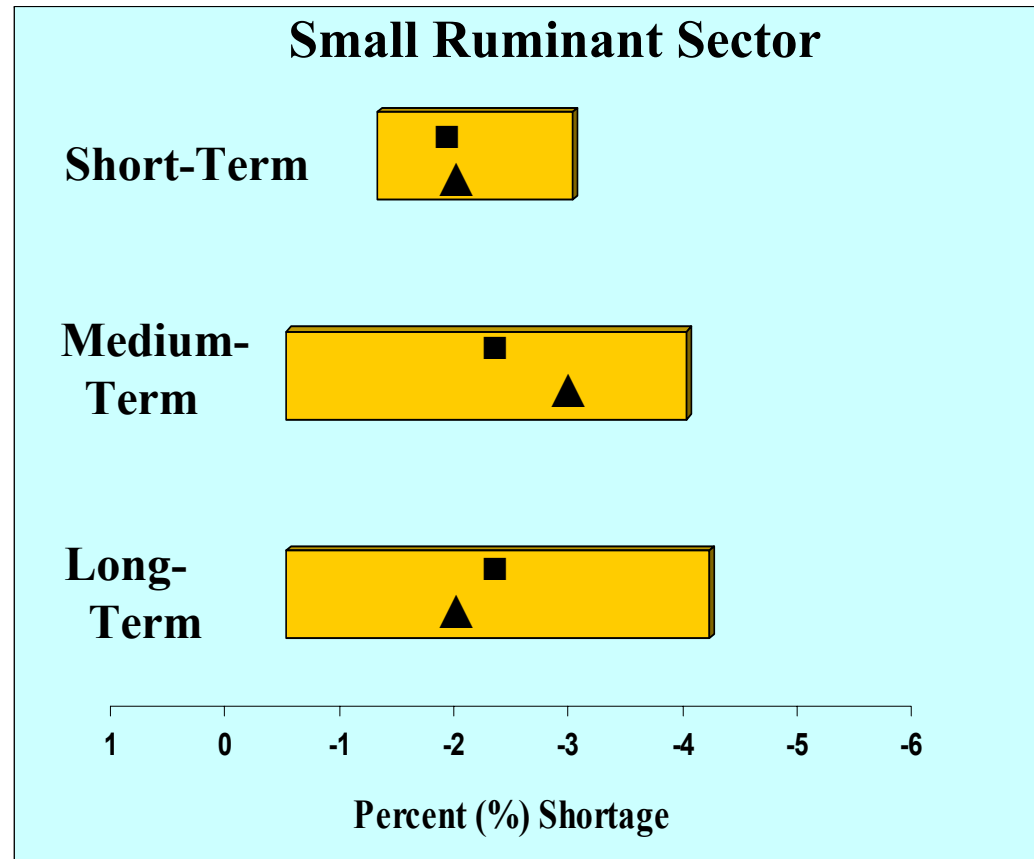
- Mid-50% = -1.3% to -3.0%
- Mean = -2.0% (■)
- Median = -2.0% (▲)

Medium-Term (2007-10):

- Mid-50%: -0.5% to -4.0%
- Mean = -2.4% (■)
- Median = -3.0% (▲)

Long-term (2010-16):

- Mid-50%: -0.5% to -4.3%
- Mean = -2.3% (■)
- Median = -2.0% (▲)



The panel reached agreement that, given current trends, there will be a shortage of food supply veterinarians in the small ruminant sector over the next several years. There was fairly close agreement, particularly in the important final survey forecast, on the general magnitude of shortage. The point estimates for all three time periods were in the 2% to 3% shortage range. The middle 50% (those between the 25th and 75th percentile of the distribution) identified a narrow range of -1.3% to -3.0% for the final short-term estimate (2004-07). The range widened slightly for later time periods, indicating more uncertainty about how current trends will play out over a longer time period. T-test analyses between sub-groups based on self-rated forecasting expertise did not find any significant differences ($p < .10$). The sub-group means for the various forecast periods were quite similar.

Near-Zero or Modest Shortages

Additional t-test analyses were conducted to further explore the range of shortage forecasts within the panel. These analyses were used to determine the factors that differentiated those estimating near-zero shortages versus those projecting moderate shortages. It should be noted that given the fair agreement within the panel, the differences between these two sub-groups were not large. A median split, based on the median shortage estimated over all time periods was used to place panelists into “near-zero shortages” and “moderate shortages” sub-groups. The median shortage for the near-zero shortage group was -1.2% and the median value for the moderate shortages was -3.5%. These analyses indicate that those seeing moderate future shortages differ from the more conservative panelists in that they see *more extreme supply-constraint problems* associated with:

- Limited lifestyle and career opportunities in rural areas (mean: 1.6 on a 7-point scale vs. 3.14 in the near-zero shortages sub-group)⁹
- Quality of advertising for small ruminant jobs (mean: 2.20 vs. 5.00 in the near-zero shortages sub-group)
- Selection of veterinary students without agricultural backgrounds (mean: 1.00 vs. 2.71 in the near-zero shortages sub-group)

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

- General lack of available small ruminants expertise (mean: 7.00 on a 7-point scale vs. 5.50 in the near-zero shortages sub-group)

As was the case with demand estimates, we see only a few systematic differences between those projecting near-zero versus modest future shortages. In general, supply-constraint concerns rather than demand-constraint concerns are the basis for differences of opinion about the extent of future shortages. The paucity of perceptions that differentiate the near-zero versus modest shortage sub-groups is very much a function of the relative agreement on the levels of shortage projected by this panel. Several other panels had lower levels of agreement.

⁹ The items were rated on a 7-point Likert-type scale and evaluated based on their influence on the future supply of small ruminant food supply veterinarians. The mean rating in parentheses is for the sub-group that forecasts moderate shortages (those seeing a 2.2% or higher average shortage) and the second mean is for the near-zero shortages sub-group (less than a 2.2% 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.

Solutions for the Future Shortage of Food Supply

Veterinarians in Small Ruminant Careers

How can the FSVM profession prepare for a better future and counter the trends that are going to lead to at least modest shortages of small ruminant 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 ratings. The following are the top 10 solutions as seen by the panel. These are listed in order of rated effectiveness in eliminating shortages:

1. Student debt repayment and scholarship programs for service in areas of need (mean of 4.54 on a 7-point scale)¹⁰
2. More involvement of food supply practitioners in training veterinary students (mean of 4.38)
3. Mentoring initiatives for students and those starting food supply careers (mean: 3.92)
4. Provide expanded job placement services in the food supply veterinary medicine areas (mean of 3.92)
5. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities (mean: 3.83)
6. Expanded paid work-study programs during the final year of the DVM programs (mean of 3.77)

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.

7. Expand the Centers of Excellence concept with a nationally recognized focus on different food supply sectors (mean: 3.55)
Note that the self-rated forecasting experts' sub-group mean of 2.3 was significantly lower than the less-expert sub-group mean of 5.00.
8. Paid externship requirement in food supply medicine during the summer (mean: 3.46)
9. Focused recruitment of high school and college students with food supply interests into veterinary colleges (mean of 3.31)
10. Development and dissemination of Business Best Practices guidance for food supply veterinary enterprises (mean: 3.17)

The means for these solutions are lower than seen in several other panels. Clearly no one or two solutions are likely to eliminate even the modest shortages seen in this sector. These actions represent possible tactics that can be integrated into a larger strategy for dealing with future shortages. Two tactics related to enhancing the interest of pre-veterinary students. For example, items 1 (debt repayment/scholarships) and 9 (focused recruitment into veterinary colleges) should have the effect of increasing the supply of students who are interested in food supply careers applying to veterinary colleges. The highest rated item (debt repayment) should have the effect of helping retain veterinary students in a food supply track. Many items focus on changing the experience that veterinary students will have over their DVM experience. Using more practitioners (item 2) represents an additional resource for educating students and giving them good insights into the demands of practice. It will also help achieve another highly rated, item 3, which is focused on providing mentoring initiatives. Items 6 (paid work-study programs) and 8 (paid externship requirement) are additional strategies for changing the educational experience that students have. These will give those pursuing a food supply track a more

hands-on educational experience and career support in pursuing a food supply path. Initiative related to item 5 (expanded job placement services) will further smooth the transition between completing food supply focused schooling and entering related post-DVM jobs. The tactics presented in items 5 (Reserve Corps) and 7 (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. The final item (10) is focused on the development and dissemination of business “best practices” to food animal veterinary enterprises. This would start with the identification of exemplars, practices that are using effective business and practice management strategies, and the development of a better understanding of why certain practices would do well in a particular setting. It is likely that some practices are universally good across all settings while others are effective only in particular settings. Enterprise size is likely to be an important contingency factor. Once identified, these insights can then be disseminated widely to others. This will provide economic benefits and advance career opportunities for all.

Conclusion: A General Need for Action

This study finds a pattern of moderately increasing demand and future shortages in the small ruminant sector of the food supply veterinary medicine profession. While the challenges inherent in the patterns projected are not formidable, some measure of preparation and strategic action is needed. Strategies focused on helping the whole FSVM profession should create a healthier larger context where leaders in the small ruminant sector can then implement additional sector-specific strategies to help deliver an adequate supply of entering veterinarians to this sector. While the shortages of small ruminant food supply veterinarians are not as challenging as other sectors, due diligence is needed to address the modest shortages that are likely to occur unless current trends are altered.

The pattern of results, from this panel as well as others, 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 and the loss of farm land) 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 small ruminant 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.

It must be noted that the shortages forecasted for small ruminant 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. Any sector, including a relatively small area of small ruminant, can be the starting point for disease, food safety, or bio-security threats that, if not contained, can light the fuse to a much broader disaster. Ignoring the future shortages of food supply veterinarians in this sector will continue to leave the door open for 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, as well as the small ruminant sector, 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.

Supplemental Information

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

1. Temporary links to the three the small ruminant 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 is similar. Try these web-links to view a copy of the three surveys completed by the small ruminant panel:
 - a. First Survey: <http://survey.cba.ksu.edu/prince/ruminants1/index.htm>
 - b. Second Survey: <http://survey.cba.ksu.edu/prince/ruminants2/index.htm>
 - c. Third Survey: <http://survey.cba.ksu.edu/prince/ruminants3/index.htm>
2. Exhibit A provides a listing of all members who originally agreed to participate in the small ruminant 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 small ruminant Delphi panel.

Exhibit A

Original Small Ruminant Delphi Panel Members¹¹

1. David Anderson
2. Joan Bowen
3. Christine Camann
4. Thomas Craig
5. Sherrill Fleming
6. Delores Gockowski
7. Linda Grayson
8. LaRue Johnson
9. Paul Jones
10. Paula Menzies
11. Paul Plummer
12. Barb Roberts
13. Joan Rowe
14. Joe Snyder
15. Lynn Tait
16. Robert Van Saun
17. Ileana Weger
18. Peregrine Wolff

¹¹ Note that not all panel members completed all surveys. These individuals originally agreed to participate.

Small Ruminants Panel

1st Survey Interim Feedback Report

This report summarizes replies to the 1st survey of the Small Ruminants 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 panel’s data will be provided after you complete the 3rd survey.)

This report identifies a few key patterns and directs you to more specific results from the 1st survey that is presented in the 2nd survey. Questions with more disagreement are repeated in the 2nd survey and panel averages and the range of replies of the middle 50% (between the 25% and 75% percentiles) are also noted in the 2nd survey. (Survey items with good consensus are not repeated.) When there is a difference between self-rated forecasting “experts” (i.e., those rating themselves as more confident in their estimates than the panel’s median score on question #32 of the 1st survey) *versus* those rating themselves as “less expert” in making forecasts, then those contrasts are noted. Significant differences between Canadian versus US panel members are noted. For example, item #1 in the first section of the 2nd survey (“Use of non-DVMs, such as veterinary technicians”) has the following notation:

“1st Survey: Average = 3.9 & Mid-50% = 3 to 4; CDN = 4.7 & US = 3.7”

This indicates that the average rating was 3.9 on a 7-point scale (just under “4. No Influence”) and the middle-50% of panelists (between the 25th and 75th percentiles) rated it from “3. Slight Decrease” to “4. No Influence”. This indicates modest disagreement on the influence of the “use of non-DVMs.” Those focused on the Canadian setting rated it as 4.7 (under “5. Slight Increase”) and US focus panel members rated it 3.7 (between “3. Slight Decrease” and “4. No Influence”). This is noted because there is a statistically significant difference between those two averages. Canadian vs. US differences also occurred on items #2 and #6 in the first set of questions. The differences between the expert vs. less-expert ratings on the first item were not significant and, thus, are not noted. (Expert vs. less expert differences occurred infrequently in the 1st survey.) 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 Small Ruminants

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:

- Growing need to track animals entering the food chain
- Zoonotic disease-related human health concerns

- Part-time farmers needing more veterinary services
- Public concerns over food safety
- Required 3rd-party certification or verification of standards
- Availability of highly technical or specialized services
- Increasing concern for animal health

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

- Concern about veterinary service costs
- Lack of veterinarian's practice management & business skills
- Federal and/or State/Provincial budgetary constraints
- Curtailment of government support of veterinary services
- Slow adoption of new technologies by veterinarians
- Use of non-DVMs, such as veterinary technicians

II. Future Demand Estimates for Food Supply Veterinarians in Small Ruminants

The average value for the general forecast of future demand for the 1st survey was 4.6 on a 7-point scale (between “4. Stay Exactly the Same” and “5. Increase Slightly”). The middle 50% of panelists (between the 25th to 75th percentiles) rated future demand between “4. Stay Exactly the Same” and “5. Increase Slightly”. There is not a significant difference between self-rated experts and the less-expert sub-groups or Canadian versus US panel members. (See question #3 in the 2nd survey.)

Additional questions asked for the “most likely” percentage increase (or decrease) in future demand for several time periods. Panel members saw future demand *increases* (beyond this fall) that averaged between +.7% and +3.4%. The middle 50% (those between the 25th and 75th percentile) forecasted demand increases that, while never negative, ranged between 0% and +5.0%. This indicates fair agreement that demand is increasing with modest disagreement about the extent that it is increasing.

Those seeing stronger future demand increases rate the demand influences (from question #1 of the 1st survey) of “Part-time farmers needing more veterinary services” as having a significantly *higher positive* influence on demand (vs. those seeing lower demand increases or decreases).

III. Factors Influencing the Supply of Food Supply Veterinarians in Small Ruminants

The more extreme negative influences on the future supply of food supply veterinarians in mixed practices in rural settings (low ratings on the question #10 items in the 1st survey – see question 8 in the 2nd survey for a related question) are:

- High debt load of veterinary school graduates

- Poor income opportunities in food supply careers
- Need to work long hours and emergency calls
- Little exposure to food supply career options in college
- Less emphasis on food animal practice in veterinary colleges

IV. Projected Shortage or Surplus for Food Supply Veterinarians in Small Ruminants

The general question asking the panel to estimate the degree of surplus vs. shortage over the next 12 years produced an average of 5.0 (“5. Slight Shortage”) on a 7-point scale (see question #10 in the 2nd survey) and the middle 50% marked “4. Very Close Match” to “5. Slight Shortage.” There are not systematic differences between how experts versus the less-expert group (or Canadians vs. US panel members) rated this question. Additional questions asked the “most likely” percentage estimates of a surplus or shortage of DVMs for several time periods. The average shortage estimates over future time periods after 2005 are between -5.3% or -5.4% and just over -3% for the recent past. The middle 50% always projected shortages within a -10.0% to 0% range - never a surplus. This is a moderate range and indicates a fair level of disagreement within the panel.

Next Steps...

The patterns that are starting to emerge tell an interesting story for DVMs in Small Ruminants area. While there are some similarities to the patterns seen in other panels, it is one that is unique from other areas of food supply veterinary medicine! Your replies to the 2nd survey will add to and clarify this story even more.

Thank you for your continuing help and involvement!

Dr. J. Bruce Prince
Professor of Management
Kansas State University
785-532-7459
jbprince@ksu.edu

September 10, 2005

Food Supply Veterinarians in Small Ruminant Practices Delphi Panel 2nd Survey Interim Feedback Report

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

This report identifies a few key patterns and more specific information from the 2nd survey is included in the 3rd 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 in the 2nd survey. When there is a difference between self-rated forecasting “experts” (i.e., the half who rated themselves as more confident in their estimates 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. Also, where there is a significant difference between those focused on the Canadian versus the US setting, then their respective means are noted. For example, item #1 in the first section of the 3rd survey (“Growth in the “ethnic” meat market”) has the following notation:

“2nd Survey: Average = 4.9 & Mid-50% = 4 to 6”

This indicates that the average of the panel was 4.9 on a 7-point scale (just under “5 Slight Increase”) and the middle-50% of panelists (those between the 25th and 75th percentiles) rated it from “4. No Influence” to “6. Increase”). Since information contrasting “expert” versus “less-expert” forecasters or Canadian versus US contrast is not provided, there was no statistically significant difference between how these subgroups rated this question. 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.

I. Factors Influencing Demand for Food Supply Veterinary 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 over both surveys are:

- Growing need to track animals entering the food chain
- Zoonotic disease-related human health concerns
- Part-time farmers needing more veterinary services
- Public concerns over food safety

- Required 3rd-party certification or verification of standards
- Increasing need for disease and food-borne illness monitoring

The influences seen as *decreasing* future demand are

- Client concerns about veterinary service costs
- Producers' low profit margins and market volatility
- Lack of veterinarian's practice management and business skill
- Curtailment of government support of veterinary services
- Availability of OTC pharmaceuticals and biologicals without veterinary oversight

II. Future Demand Estimates for Food Supply Veterinarians

The average value for the general forecast of future demand from the 2nd survey is 4.5 (between "4. Stay Exactly the Same" and "5. Increase Slightly") and the middle 50% of the panel rating future demand between "3. Decrease Slightly" and "5. Increase Slightly." Over 20% projected decreasing demand and 69% marked "5. Increase Slightly" indicating increasing demand. Those rating themselves as more expert forecasters than the panel mean rated demand as "4. Stay Exactly the Same" in contrast to the less-expert subgroup who rated demand as "5. Increasing Slightly." This is a statistically significant difference.

Additional questions asked for the "most likely" estimate of changes in future demand for several time periods. The average was between +.1% to +2.0% increases over these time periods and the middle 50% projected increasing demand for veterinary services between zero to +4.0% in those time periods. 23% of the panel projected decreases or no growth in demand while the rest forecasted increasing demand. Those rating themselves as expert forecasters tended to see lower demand increases than the less-experts subgroup by a statistically significant margin.

Panel members seeing *stronger* future demand (compared to those seeing *weaker* future demand) saw a significantly *less negative* influence in the following:

- Use of non-DVMs, such as veterinary technicians
- Producers' low profit margins and market volatility
- Reduced government for extension services

Those forecasting *stronger* demand also rated the following "demand influences" (from question 1 in the 2nd survey) as having a significantly *higher positive* influence on future demand:

- Growth of smaller farms and hobby farm segment
- General lack of available small ruminants expertise
- Demand for "farm to fork" accountability and tracking

Selected activities and skills projected to have uniquely higher or lower demand were identified in the 1st survey and rated by the panel in the 2nd survey. The more extreme areas of *highest increasing* demand include:

- “Pet” type services
- Telephone or on-line consultation
- Client educational activities
- Diagnosis and control of reportable diseases

III. Factors Influencing the Supply of Food Supply Veterinarians

The more extreme *negative* influences on the future supply of food supply veterinarians into small ruminants practices noted in the two previous surveys are:

- High debt load of veterinary school graduates
- Poor income opportunities in food supply careers
- Need to work long hours and emergency calls
- Less emphasis on food animal practice in veterinary colleges

The more extreme *positive* influences on the future supply of food supply veterinarians noted are:

- Attractiveness of small ruminants to female veterinarians
- Growth in hobby farms
- Ease of working with small ruminants versus large bovines
- More women veterinarians entering the workforce

IV. Projected Shortage or Surplus of Food Supply Veterinarians

The question on the general forecast of shortages versus surpluses (see question #9, 3rd survey) produced an average of 4.9 (just under “5. Slight Shortage.” The middle 50% rated “5. Slight Shortage.” In fact, 62% made this rating. The specific average shortage estimates over all time periods projected ranged from -1.6% to -3.0% shortages and the middle 50% (between the 25th and 75th percentile) always projected shortages from just above 0% to -5.0%). Approximately 20% of the panel projected a coming surplus while the rest see a shortage of food supply veterinarians in this area.

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 small ruminant practices. Your replies to the third and final survey will add to and clarify this story even more.

Besides making the final estimates to some previously seen questions, you will evaluate several potential solutions for the shortage problem noted by the majority.

Thank you for your continuing help and involvement! The final survey will have a large influence on the conclusions we will reach about this important area of food supply veterinary medicine.

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Exhibit D

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

Survey Item	Survey Wave ¹⁴	% Decrease ¹⁵	% No Influence	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Public concern over food Safety	1 st	0	6.3	93.8	5.5	.73	5 to 6	16
2. Use of non-DVMs, such as veterinary technicians	1 st	28.6	50	21.4	3.9	.73	3 to 4.3	14
2. Use of non-DVMs, such as veterinary technicians	2 nd	38.5	46.2	15.4	3.9	.90	3 to 4	13
3. Public concern over bio-terrorism	1 st	0	35.7	64.3	5.8	.70	4 to 5	14
4. Zoonotic disease-related human health concerns	1 st	0	0	100	5.7	.49	5 to 6	15
5. Required third party certification or verification of standards	1 st	0	13.3	86.7	5.4	.74	5 to 6	15
6. Limited public understanding of food quality and safety issues	1 st	0	57.1	42.9	4.5	.65	4 to 5	14
7. More meat consumption in the US and Canada	1 st	0	46.7	53.3	4.7	.80	4 to 5	15
8. More access to global markets for food exports	1 st	0	25	75	4.9	.68	4.3 to 5	16
9. Changing dietary habits in third-world countries	1 st	6.3	25	68.8	4.9	.89	4 to 5.8	16
10. Need to protect indigenous wildlife from exotic diseases	1 st	0	57.1	42.9	4.6	.84	4 to 5.3	14
11. Federal and/or state/provincial budgetary constraints	1 st	35.7	57.1	7.1	3.6	.85	3 to 4	14
12. Curtailment of government support of veterinary services	1 st	35.7	50	14.3	3.6	1.02	2.8 to 4	14
12. Curtailment of government support of veterinary services	2 nd	41.7	58.3	0	3.5	.67	3 to 4	12
13. Increasing concern for animal wildlife	1 st	0	20	80	5.2	.78	5 to 6	15
14. Increasing concern for animal health	1 st	0	0	100	5.4	.50	5 to 6	16
15. Need to understand animal-human health eco-systems	1 st	0	46.7	53.3	4.6	.63	4 to 5	15
16. Availability of highly technical or specialized services	1 st	0	12.5	87.5	5.4	.72	5 to 6	16
17. Veterinary services agreements required for agri-business loans	1 st	0	28.6	71.4	5.1	.86	4 to 6	14
18. Growing need to track animals entering the food chain	1 st	0	6.3	93.8	5.8	1.00	5 to 7	16
18. Growing need to track animals entering the food chain	2 nd	0	7.7	92.3	5.7	.95	5 to 6.5	13
19. Constraints on non-DVMs giving prescription drugs	1 st	6.7	33.3	60	4.9	1.28	4 to 6	15

¹⁴ 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.

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.

19. Constraints on non-DVMs giving prescription drugs	2 nd	0	30.8	69.2	4.9	.76	4 to 5.5	13
20. Slow adoption of new technologies by veterinarians	1 st	42.9	35.7	21.4	3.7	1.14	3 to 4.3	14
20. Slow adoption of new technologies by veterinarians	2 nd	33.3	50	16.7	3.8	.72	3 to 4	12
21. Move to larger sized producer operations	1 st	40	26.7	33.3	4.0	1.00	3 to 5	15
21. Move to larger sized producer operations	2 nd	23.1	53.8	23.1	4.1	.86	3.5 to 4.5	13
22. Client use of veterinary herd management services	1 st	6.7	0	93.3	5.1	.74	5 to 6	15
23. Client concerns about veterinary service costs	1 st	57.1	42.9	0	3.2	.80	2.8 to 4	14
24. Lack of veterinarian's practice management and business skill	1 st	53.3	46.7	0	3.4	.63	3 to 4	15
25. Part-time farmers needing more veterinary services	1 st	0	6.3	93.8	5.6	.89	5 to 6	16
134. Small ruminants being treated as pets and high care expectations	2 nd	0	16.7	83.3	5.2	.72	5 to 6	12
135. Interest in locally-produced high quality meats	2 nd	0	7.7	92.3	5.2	.60	5 to 6	13
136. Interest in healthy "organic" food products	2 nd	8.3	33.3	58.3	4.6	.79	4 to 5	12
137. Growth in the "ethnic" meat market	2 nd	7.7	23.1	69.2	4.9	1.04	4 to 5.5	13
137. Growth in the "ethnic" meat market	3 rd	0	15.4	84.6	5.2	.83	5 to 6	13
138. Growth of smaller farms and hobby farm segment	2 nd	7.7	0	92.3	5.4	.96	5 to 6	13
139. Demand for herd health services	2 nd	0	23.1	76.9	4.8	.44	4.5 to 5	13
140. Demand for reproduction and genetics expertise	2 nd	0	23.1	76.9	5.0	.82	4.5 to 5	13
141. Demand for "farm to fork" accountability and tracking	2 nd	0	23.1	76.9	5.4	.96	4.5 to 6	13
141. Demand for "farm to fork" accountability and tracking	3 rd	0	7.7	92.3	5.2	.69	5 to 5	13
142. Increasing need for disease and food-borne illness monitoring	2 nd	0	7.7	92.3	5.5	.78	5 to 6	13
143. Reduced government funding for extension services	2 nd	23.1	38.5	38.5	4.2	1.07	3.5 to 5	13
143. Reduced government funding for extension services	3 rd	15.4	46.2	38.5	4.2	.73	4 to 5	13
144. Trend toward veterinarian as advice-giver rather than animal caregiver	2 nd	8.3	50	41.7	4.5	.91	4 to 5	12
145. General lack of available small ruminants expertise	2 nd	15.4	30.8	53.8	4.5	1.05	4 to 5	13
145. General lack of available small ruminants expertise	3 rd	0	25	75	4.8	.58	4.3 to 5	12
146. Producers' low profit margins and market volatility	2 nd	61.5	38.5	0	3.3	.63	3 to 4	13
147. Availability of OTC pharmaceuticals and biologicals without veterinary oversight	2 nd	46.2	53.8	0	3.5	.52	3 to 4	13
148. Urbanization and loss of farm/agricultural land	2 nd	46.2	38.5	15.4	3.7	1.03	3 to 4	13
148. Urbanization and loss of farm/agricultural land	3 rd	30.8	61.5	7.7	3.8	.93	3 to 4	13
149. High cost of food safety and accountability requirements for producers	2 nd	30.8	30.8	38.5	4.0	1.00	3 to 5	13
149. High cost of food safety and accountability requirements for producers	3 rd	23.1	46.2	30.8	4.0	.91	3.5 to 5	13

Section II. Specialized Activities Increasing or Decreasing in Demand Relative to the General Pattern in Small Ruminant FSVM Careers

Survey Item	Survey Wave	% Lower ¹⁶	% No Difference	% Higher	Mean	Standard Deviation	Middle 50% Range	N
1. Herd nutrition consulting	2 nd	7.7	30.8	61.5	4.8	.93	4 to 5.5	13
2. Diagnosis and control of reportable diseases	2 nd	0	15.4	84.6	5.2	.69	5 to 6	13
3. Client educational activities	2 nd	0	15.4	84.6	5.3	.86	5 to 6	13
4. Delivery of herd health management programs	2 nd	0	30.8	69.2	5.0	.82	4 to 6	13
5. Reproduction related services	2 nd	0	30.8	69.2	5.0	.91	4 to 5.5	13
6. Telephone or online consultation	2 nd	0	15.4	84.6	5.4	.87	5 to 6	13
7. Third party animal health certifications	2 nd	0	41.7	58.3	4.8	.84	4 to 5.8	12
8. “Pet” type services	2 nd	7.7	23.1	69.2	5.4	1.33	4 to 6.5	13
9. Services focused on “exotic” small ruminants	2 nd	7.7	38.5	53.8	4.7	.95	4 to 5.5	13
10. Routine services to hobby farmers and small producers	2 nd	15.4	15.4	69.2	4.9	1.14	4 to 5.5	13
11. Individual sick animal care	2 nd	38.5	23.1	38.5	4.0	1.35	3 to 5	13
12. Dispensing pharmaceuticals	2 nd	23.1	46.2	30.8	4.2	1.01	3.5 to 5	13

¹⁶ 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 Small Ruminant FSVM Careers

Survey Item	Survey Wave	% Decrease ¹⁷	% No Influence	% Increase	Mean	Standard Deviation	Middle 50% Range	N
1. Less emphasis on food animal practice in veterinary colleges	1 st	81.3	18.8	0	5.5	.73	5 to 6	16
1. Less emphasis on food animal practice in veterinary colleges	2 nd	100	0	0	2.7	.48	2 to 3	13
2. More women veterinarians entering the workforce	1 st	12.5	31.3	56.3	3.9	.73	3 to 4.3	14
2. More women veterinarians entering the workforce	2 nd	15.4	30.8	53.8	4.4	1.04	4 to 5	13
2. More women veterinarians entering the workforce	3 rd	0	7.7	92.3	5.0	.41	5 to 5	13
3. Physical demands of large animal veterinary work	1 st	43.8	50	6.3	4.8	.70	4 to 5	14
4. Need to work long hours and emergency calls	1 st	100	0	0	5.7	.49	5 to 6	15
5. Little exposure to food supply career options in college	1 st	87.5	12.5	0	5.4	.74	5 to 6	15
6. Lack of food supply practice-related externships for students	1 st	73.3	26.7	0	4.5	.65	4 to 5	14
7. Lack of positive role models in veterinary food supply practice	1 st	93.3	6.7	0	4.7	.80	4 to 5	15
8. Poor income opportunities in rural areas	1 st	100	0	0	4.9	.68	4.3 to 5	16
9. Lack of cultural and recreational opportunities in rural areas	1 st	43.8	56.3	0	4.9	.89	4 to 5.8	16
10. Lack of spousal career options in rural areas	1 st	75	25	0	4.6	.84	4 to 5.3	14
11. Limited lifestyle and career opportunities in rural areas	1 st	50	43.8	6.3	3.6	.85	3 to 4	14
11. Limited lifestyle and career opportunities in rural areas	2 nd	53.8	46.2	0	3.2	.99	2.5 to 4	13
12. Federal and/or state/provincial budgetary constraints	1 st	31.3	68.8	0	3.6	1.02	2.8 to 4	14
13. High debt load of veterinary school graduates	1 st	87.5	12.5	0	5.2	.78	5 to 6	15
14. Expected high number of food supply veterinarians retiring in the near future	1 st	50	12.5	37.5	5.4	.50	5 to 6	16
14. Expected high number of food supply veterinarians retiring in the near future	2 nd	66.7	16.7	16.7	3.3	1.29	2 to 4	12
14. Expected high number of food supply veterinarians retiring in the near future	3 rd	38.5	30.8	30.8	4.0	1.00	3 to 5	13
15. Limited capacity of existing veterinary colleges in the US and/or Canada	1 st	23.1	76.9	0	4.6	.63	4 to 5	15
16. Perceived lack of demand for food animals	1 st	84.6	15.4	0	5.4	.72	5 to 6	16

¹⁷ 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.”

17. Requirement for education beyond a DVM	1 st	66.7	33.3	0	5.1	.86	4 to 6	14
89. Ease of working with small ruminants versus large bovines	2 nd	0	15.4	84.6	4.9	.38	5 to 5	13
90. Mentoring and externship initiatives in this area	2 nd	7.7	53.8	38.5	4.4	.77	4 to 5	13
91. Growth in hobby farms	2 nd	0	23.1	76.9	4.9	.64	4.5 to 5	13
92. Income opportunities in small ruminants practice	2 nd	38.5	30.8	30.8	4.0	1.00	3 to 5	13
92. Income opportunities in small ruminants practice	3 rd	30.8	53.8	15.4	3.8	.83	3 to 4	13
93. Government support programs such as school loan repayment	2 nd	23.1	30.8	46.2	4.4	1.04	3.5 to 5	13
93. Government support programs such as school loan repayment	3 rd	7.7	46.2	46.2	4.4	.96	4 to 5	13
94. Attractiveness of small ruminants to female veterinarians	2 nd	0	23.1	76.9	4.9	.64	4.5 to 5	13
95. Attractiveness of small ruminants to urban (non-ag) students	2 nd	15.4	46.2	38.5	4.2	.73	4 to 5	13
96. Level of exposure of students in schools to benefits and available small ruminant jobs	2 nd	30.8	30.8	38.5	4.2	1.09	3 to 5	13
96. Level of exposure of students in schools to benefits and available small ruminant jobs	3 rd	23.1	30.8	46.2	4.2	.83	3.5 to 5	13
97. Rural lifestyle and setting that go with rural practice	2 nd	46.2	38.5	15.4	3.8	.93	3 to 4	13
98. Level of exposure to food animal practice in schools	2 nd	69.2	7.7	23.1	3.6	1.04	3 to 4.5	13
98. Level of exposure to food animal practice in schools	3 rd	7.7	61.5	30.8	4.2	.60	4 to 5	13
99. Level of quality of advertising for small ruminant jobs	2 nd	25	58.3	16.7	3.9	.67	3.3 to 4	12
100. Selection of veterinary students without agriculture backgrounds	2 nd	61.5	38.5	0	3.2	.73	3 to 4	13

Section IV. Solutions to Shortages in Small Ruminant Careers

Survey Item	Survey Wave	% Less Effective ¹⁸	% 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	76.9	15.4	7.7	2.9	1.80	1.5 to 4	13
2. Expand the Centers for Excellence concept where nationally recognized focus on different food supply sectors	3 rd	36.4	63.6	0	3.6	1.21	3 to 4	11
3. Focused recruitment of high school and college students with food supply interests into veterinary colleges	3 rd	53.8	23.1	23.1	3.7	2.14	2 to 5.5	13
4. Increased focus of food supply coverage early in DVM curriculum	3 rd	61.5	30.8	7.7	3.4	1.50	2.5 to 4	13
5. Expanded business and practice management coverage in DVM curriculum	3 rd	61.5	38.5	0	3.3	1.18	2 to 4.5	13
6. Expanded postgraduate fellowships in food supply areas	3 rd	53.8	30.8	15.4	3.6	1.66	2 to 5	13
7. Expanded paid work-study programs during the final year of DVM	3 rd	38.5	46.2	15.4	4.2	1.41	3 to 5	13
8. More involvement of food supply practitioners in training veterinary students	3 rd	23.1	61.5	15.4	4.4	1.33	3.5 to 5	13
9. Provide expanded job placement services in the food supply veterinary medicine areas	3 rd	38.5	38.5	23.1	4.2	1.82	2.5 to 5.5	13
10. Appointment of more food supply faculty at colleges of veterinary medicine	3 rd	53.8	46.2	0	3.7	1.18	3 to 5	13
11. Paid externship requirement in food supply medicine during the summer	3 rd	38.5	61.5	0	3.8	1.30	3 to 5	13
12. Marketing campaigns to increase awareness of food supply career and lifestyle opportunities	3 rd	61.5	30.8	7.7	3.3	1.49	2.5 to 4.5	13
13. Student debt repayment and scholarship programs for service in food supply areas of need	3 rd	23.1	53.8	23.1	4.5	1.76	3.5 to 5.5	13
14. Development of a government-supported Reserve Corps of food supply DVMs for disease surveillance and control activities	3 rd	33.3	58.3	8.3	4.0	1.28	3 to 5	12
15. Low cost (subsidized) consulting in business and practice	3 rd	66.7	25	8.3	3.4	1.73	2 to 5	12

¹⁸ 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.”

management for new food supply DVMs								
16. Mentoring initiatives for students and those starting a food supply career	3 rd	38.5	38.5	23.1	4.3	1.70	3 to 5.5	13
17. Focused recruitment of women students in food supply areas	3 rd	50	41.7	8.3	3.8	1.55	2.3 to 5	12
18. Development and dissemination of Business Best Practices for food supply veterinary enterprises	3 rd	50	41.7	8.3	3.6	1.38	3 to 4.8	12