



R-CALF USA

03-080-1
1399

P.O. Box 30715
Billings, MT 59107
Phone: 406-252-2516
Fax: 406-252-3176
E-mail: r-calfusa@r-calfusa.com
Website: www.r-calfusa.com

DIRECTORS

President/ Region I

Leo McDonnell, Jr.
Columbus, MT

Vice President/ Region II

Kathleen Kelley
Meeker, CO

Region III

Herman
Schumacher
Herreid, SD

Region IV

Jon Wooster
San Lucas, CA

Region V

Chuck Kiker
Beaumont, TX

Region VI

Malcolm Moore
Auburn, KS

Region VII

Jerry Swartz
Alexandria, MN

Region VIII

Gene Barber
Lexington, KY

Region IX

James Fudge
Colquitt, GA

Region X

James McCuen
Okanogan, WA

C.E.O.

Bill Bullard
Billings, MT

April 7, 2004

Docket No. 03-080-1
Regulatory Analysis and Development
PPD, APHIS, Station 3C71
4700 River Road, Unit 118
Riverdale, MD 20737-1238

Via Hand Delivery

Re: Docket No. 03-080-1: Bovine Spongiform Encephalopathy; Minimal Risk Regions and Importation of Commodities – R-CALF USA's Addendum to Comments Submitted on January 5, 2004

Dear Administrator:

Thank you for the second opportunity to comment on the Animal Plant Health Inspection Service's (APHIS's) proposal to amend the regulations regarding the importation of animals and animal products to recognize a category of regions that present a minimal risk of introducing bovine spongiform encephalopathy (BSE) into the United States via live ruminants and ruminant products, and to list Canada as the first region in this category.

The Ranchers-Cattlemen Action Legal Fund - United Stockgrowers of America (R-CALF USA) is a non-profit association representing over 52,000 cattle producers, of which 8,400 are voluntary, dues-paying R-CALF USA members and over 43,000 are members of R-CALF USA's 58 affiliated cattle associations. R-CALF USA represents U.S. cattle producers on issues concerning national and international trade and marketing and is dedicated to ensuring the continued profitability and viability of the U.S. cattle industry. R-CALF USA's membership consists primarily of cow-calf operators, cattle backgrounders, and independent feedlot owners. Various main street businesses are associate members of R-CALF USA.

R-CALF USA previously submitted comprehensive comments to APHIS on the proposed rule on January 5, 2004. In its 18-page January 5 comments, R-CALF USA urged APHIS to withdraw the proposed rule based on compelling scientific evidence that suggested that the regulations would expose the United States cattle industry to substantially greater and unnecessary risk that BSE would be introduced into a herd. Additionally, United States consumers would be subjected to both greater and unnecessary risk if the United States did not

RECEIVED

APR 07 2004

continue to enforce its longstanding policy of prohibiting the importation of ruminants and ruminant products from any country known to have BSE.

Because APHIS was not moved by numerous requests to withdraw the proposed rule, including the comments submitted by R-CALF USA on January 5, 2004, we submit the following supplemental comments to further demonstrate that the proposed rule is reckless and irresponsible, and constitutes an endangerment of the health and economic viability of the United States cattle industry.

The APHIS proposal to amend its regulations to recognize a category of regions that present a minimal risk of introducing BSE into the United States via live ruminants and ruminant products, and to list Canada as the first region in this category should be withdrawn entirely for the following reasons:

1. The "Risk Analysis" Prepared by APHIS Does Not Provide an Adequate Basis for the Decision to Import Live Ruminants and Ruminant Products From Canada

In the November 4, 2003 and March 8, 2004 Federal Register notices of the proposed rule, APHIS asserts that the new "BSE minimal-risk region" category is supported by an October 2003 report entitled, "Risk Analysis: BSE Risk from Importation of Designated Ruminants and Ruminant Products from Canada into the United States" (the "Risk Analysis"), and a February 2004 "Explanatory Note" to supplement the Risk Analysis.¹ The Explanatory Note was filed after the December 23, 2003 discovery of a BSE-infected cow, of Canadian origin, in Moses Lake, Washington.

As demonstrated by the attached evaluation prepared by Dr. Louis Anthony Cox, Jr., a nationally recognized expert on risk analysis, the Risk Analysis provides only a superficial and rudimentary analysis of the risks posed by the proposed rule.² It lacks many of the key elements of a valid risk assessment.³ Little to no actual data was considered and, accordingly, the conclusions reached are expressed in vague, subjective terms.⁴ Such an analysis

¹ See 68 Fed. Reg. 62,386 (Nov. 4, 2003) and 69 Fed. Reg. 10,633 (March 8, 2004).

² L. A. Cox, Jr., Evaluation of the Adequacy and Appropriateness of Risk Analysis Used by the U.S. Department of Agriculture Animal and Plant Health Inspection Service in Support of Proposal To List Canada as a Bovine Spongiform Encephalopathy Minimal Risk Region ("Cox Evaluation"). A copy of Dr. Cox's paper is attached to these comments as Appendix A.

³ Id. at 4.

⁴ Id.

is not a useful tool to use to make a decision on whether to take an action that could have a significant impact on human or animal health.⁵ According to Dr. Cox, at best, the Risk Analysis provides an interesting overview of the general risks of importing BSE-infected ruminants and ruminant products, and the safeguards in the proposed rule intended to reduce those risks.⁶ To fully understand the risks, a thorough, detailed, and methodologically valid risk analysis is needed. Dr. Cox states his conclusions regarding the adequacy of the Risk Analysis as follows:

In summary, the information provided by the Risk Analysis does not provide reasonable basis from which to make an informed decision on whether to reinstate trade in ruminants and ruminant products with Canada. For at least the reasons discussed above, it does not provide a technically complete or sound risk analysis, as the term is usually understood. It does not provide the essential technical information needed to inform risk management decision makers about potential risks. This includes information about exposures, currently estimated true prevalence rates of BSE in Canada, frequencies of compliance and error rates, potential for unusually large or severe adverse consequences of BSE cases under some conditions, and remaining uncertainties. In the absence of such currently available risk assessment information, a decision based on the current USDA Risk Analysis will not be informed by an understanding of the relevant risks to US populations.⁷

A regulatory action such as this that can have a significant health and economic impact must only be made after the agency and the public have valid information on the actual risks posed by the action. Taking action without such information is irresponsible and a violation of the public's trust.

2. The Inadequate APHIS Risk Analysis Failed to Answer Key Questions Regarding the Impact of the Proposed Rule on Human Health

While the impact of the proposed rule on animal health and economic interests is extremely important, R-CALF USA believes that the paramount concern of a risk assessment should be the potential impact of the proposed rule

⁵ Id.

⁶ Id. at 6.

⁷ Id. at 19-20.

on the health and safety of U.S. consumers, and adopting a policy regarding imports of ruminants and ruminant products that results in the lowest risk of human exposure to BSE. While that may seem obvious, it is impossible to tell from the proposed rule, the APHIS Risk Analysis, or the Harvard University study, what effect, if any, the proposed rule will have on human health. The risk to human health has simply not been assessed. Dr. Cox states in his evaluation that the APHIS Risk Analysis did not address two key questions:

- (a) What is the probable change in human health risk (i.e., frequency and severity of adverse human health effects) that would be caused by each alternative risk management option considered (e.g., reopening the US to less restricted imports of Canadian ruminants vs. imposing different types of restrictions vs. keeping the status quo); and
- (b) How certain is the change in human health risk that would be caused by each proposed risk management action?⁸

It is now generally accepted that the agent that causes BSE, also causes a similar condition in humans known as variant Creutzfeldt-Jakob disease ("vCJD"). According to the World Health Organization "considerable epidemiological, neuropathological, and experimental data are consistent with the hypothesis that the agent that causes BSE in cattle also causes vCJD in humans."⁹ Consumption of food contaminated with the BSE agent is thought to be the most likely way humans contract vCJD.¹⁰ Indeed, APHIS recognized that occurrences of vCJD is a public health consequence of the proposed rule.¹¹ However, APHIS fails to address at all the question of, even with the import restrictions in the proposed rule, how many new cases of vCJD could there be? None? One? Two? More? As Dr. Cox demonstrates, APHIS does not provide any real analysis of the risk.¹²

In its Risk Analysis, APHIS states:

Because of the limited scope of its regulatory authority, this APHIS analysis will not focus on human health issues, with one exception. Human health issues will be addressed solely in the

⁸ Id. at 4.

⁹ Understanding the BSE threat, World Health Organization, WHO/CDS/CSR/EPH/2002.6 (Oct. 2002), at 10.

¹⁰ Id.

¹¹ Risk Analysis at 3.

¹² Cox Evaluation at 6-7.

potential exposure of *and consequences to* humans should BSE infected material enter the United States AND enter the human food supply. Relevant to this, an evaluation conducted in the context of both human and animal health by the Harvard Center for Risk Analysis ... concluded that the United States is highly resistant to spread and establishment of BSE in the unlikely event of its entry into the United States.¹³

APHIS then devotes a mere two paragraphs to its conclusion on public health and, recognizing that “there are many unknown factors relative to the development of vCJD,” concludes that the “[r]isk of such public health consequences [i.e. vCJD] *should be* extremely low in the context of importation of BSE infected commodities from Canada.”¹⁴ Dr. Cox sums up the APHIS Risk Analysis as follows:

In summary, it is not clear what USDA’s “Risk Estimation” conclusions mean in terms of human or animal health impacts, or how they are derived from or supported by factual evidence and objective data. The resulting qualitative reassurances do not constitute an adequate “Risk Analysis”, as the essential components of what is usually meant by risk analysis are missing.¹⁵

The Harvard Risk Analysis similarly did not assess the risk of US consumers developing vCJD from imported cows or meat. The report provided:

The analysis is not a complete human health risk assessment in two respects. First, we do not quantify the probability that BSE will be introduced into the U.S. Hence, all our risk estimates are conditional on hypothetical scenarios. Second, although we quantify potential human exposure to BSE-contaminated food products, we do not estimate how many people will contract variant Creutzfeldt-Jakob Disease (vCJD). We have omitted quantitative treatment of both of these issues because the available information is inadequate.¹⁶

¹³ Risk Analysis: BSE Risk from Importation of Designated Ruminants and Ruminant Products from Canada into the United States, USDA – Animal and Plant Health Inspection Service, Veterinary Services, October 2003, at 7.

¹⁴ Id. at 33 (emphasis added).

¹⁵ Cox Evaluation at 7.

¹⁶ Harvard Study at 2.

R-CALF USA does not agree that limited information is a legitimate reason for not conducting a human health risk assessment. Furthermore, inadequate information does not obviate the need for a thorough human health risk assessment in the context of promulgating a rule that could have a significant adverse effect on human health. On the contrary, when maintaining the status quo will have no adverse impact on public health, and a proposed change could have a negative impact on public health, sound public health policy dictates that the change not be made until all information needed to adequately assess the public health risk is available, unless there is an overriding need to make the change before such information is available. Lower cattle prices simply cannot be such a need.

R-CALF USA is especially troubled by the lack of information on how this rule will effect human health. The proposed rule should not be promulgated until its potential impact on human health is fully assessed.

3. Secretary Veneman's Own Advisory Committee on Foreign Animal and Poultry Diseases Cautioned Her Against Making BSE-related Regulatory Decisions Until a More Thorough Scientific Risk Assessment is Completed.

The Secretary's Advisory Committee on Foreign Animal and Poultry Diseases reported:

“. . . [T]he Committee cannot adequately resolve the differing BSE risk assessment presented by the Subcommittee [International Review Subcommittee] compared to the assessment by Harvard University. . . The Committee must have this issue of risk resolved prior to completing its recommendations to the Secretary. It is imperative that the Secretary has the best available science and more precise risk assessments in order to make appropriate regulatory decisions.”¹⁷

After establishing that there is a major discrepancy between the scientific risk assessments completed by the International Review Subcommittee and Harvard University, the Committee reiterated the need to reconcile the discrepancy before making any future decisions. In the report's conclusion, the Committee wrote, “It is imperative that all future decisions be based on the best

¹⁷ Report to the Secretary's Advisory Committee on Foreign Animal and Poultry Disease, Measures Relating to Bovine Spongiform Encephalopathy in the United States, February 13, 2004, at 2.

available science and that all necessary steps be taken to protect the safety of the public as well as the economic viability of animal agriculture in the United States.”¹⁸

R-CALF USA supports the Committee’s recommendation regarding the risk assessment and urges APHIS to withdraw its proposed rule until the United States completes a new risk assessment that definitively establishes the United States risk of exposure to BSE from countries known to have BSE in their cattle herd.

4. The APHIS Risk Analysis Misrepresents and Misuses the Harvard Risk Assessment to Support the Proposed Rule, and, There is a Discrepancy Between the Two Documents Regarding the Prevalence of the BSE Agent in Canada.

In his evaluation of the APHIS Risk Analysis, Dr. Cox states that:

The “Risk Estimation” section of the Risk Analysis states that its conclusions “are consistent with the 2001 Harvard study, which found that the measures taken by the US government and industry make the United States robust against the spread of BSE, should it be introduced into the country.” This overstates what the Harvard Center for Risk Analysis (HCRA) model (the “Harvard Study”) actually found. While that study indicated that its *base case assumptions* implied a high degree of robustness against the spread of BSE, it also clearly indicated that there is enough uncertainty about the validity of these assumptions so that no single, unambiguous set of conclusions can be drawn with very high confidence.¹⁹

In Dr. Cox’s opinion, “The original Harvard Study was prepared in 2001 for a totally different purpose than to serve as analytic support for the importation of live ruminants and ruminant products from Canada.”²⁰ Based on his review of the two studies, Dr. Cox notes that:

The USDA Risk Analysis systematically misinterprets the Harvard Study as being more definitive and reassuring than it really is, e.g., by stating that “The Harvard study found that even if BSE were to

¹⁸ Id. at 3.

¹⁹ Cox Evaluation at 7 (footnotes omitted).

²⁰ Id.

enter the United States, it would be unlikely to spread.” That is not a correct summary of what the Harvard Study found.²¹

Furthermore, the October 2003 update to the Harvard University Risk analysis directly contradicts the APHIS Risk Analysis also conducted in October 2003 which describes the prevalence of BSE in Canada as “low” based on “only a single infected Canadian animal that has been identified.”²² However, the independent Harvard University Analysis, which was also conducted before the second Canadian BSE case, contradicts the APHIS claim by stating the prevalence of BSE in Canada could not be determined because of the “absence of strong evidence about the prevalence of BSE in the Canadian herd.”²³ Thus, the APHIS claim that Canada’s BSE prevalence is “low” cannot be supported, cannot be verified, and contradicts the more exhaustive Harvard study: What is ever more baffling, is that the discovery of a second case of BSE in a Canadian cow somehow caused APHIS to downgrade Canada’s BSE prevalence to “very low” in its February 2004 Explanatory Notes and in the Federal Register notice of March 8, 2004, without any support or evidence. As Dr. Cox noted, APHIS did not present any quantitative estimate of the prevalence of BSE in Canada.²⁴

R-CALF USA is concerned that the foregoing evidence suggests that APHIS is ignoring science, ignoring the actual risks, and is assuming a “lobbyist role” in its efforts to expose the U.S. cattle industry to greater risk.

5. APHIS’ Conclusion that the BSE Case in a Second Cow of Canadian Origin Does Not Alter Its Initial Risk Estimate is Without Foundation Because Neither APHIS Nor Canada has Taken, Nor do they Plan to Take, Any Meaningful Steps to Determine the Prevalence of BSE in Canada.

As stated previously, APHIS’ initial risk estimate described the prevalence of BSE in Canada as “low” based on “only a single infected Canadian animal that has been identified.”²⁵ However, there have now been two cases of BSE

²¹ Id. at 10.

²² Risk Analysis: BSE Risk from Importation of Designated Ruminants and Ruminant Products from Canada into the United States, USDA – Animal and Plant Health Inspection Service, Veterinary Services, October 2003, at 31.

²³ Evaluation of the Potential Spread of BSE in Cattle and Possible Human Exposure Following Introduction of Infectivity into the United States from Canada, Joshua T. Cohen and George M. Gray, Harvard Center for Risk Analysis, Harvard School of Public Health (the “Harvard Study”), at 2.

²⁴ Cox Evaluation at 14.

²⁵ Risk Analysis at 31.

originating from Canada, and in neither case has the exact source or timing of the BSE infection been identified. Until the source of the contaminated feed is definitely known, it is not possible to conclude with certainty the age of the index cows at the time of infectivity. Even though animals are more susceptible during the first six months of life, the two- to eight-year incubation period for BSE provides the possibility that both infected cows were infected after the Canadian feed ban was in place.

The combined unknown source of infectivity and unknown timing of infectivity establishes a possibility that both index cows ingested the BSE agent after the feed ban was in place – a scenario suggesting there could be a continuing risk of BSE in younger Canadian cattle. APHIS must either identify the source and timing of infection in order to conclude that the prevalence of BSE is low in Canada, or Canada must begin testing a more representative sample of the Canadian herd than it is presently contemplating. Canada is planning to test approximately 8000 head of cattle during the next 12 months.²⁶ While this level of surveillance may suffice for a country in which BSE is not known to exist, it is woefully inadequate for a country which produced two cases of BSE in less than 12 months under limited surveillance.

Lacking any definitive evidence regarding the exact source of infectivity and timing of infectivity, Canada should be required to test all cattle over 24 months of age for a period of two years for purposes of determining the prevalence of BSE in the Canadian herd. The United States should not consider relaxing its border restrictions for countries in which the prevalence of BSE is unknown.

6. Canada's Feed Ban, Its Principle BSE Defense, is Less Stringent Than the United States' Feed Ban and the United States Should Not Accept Imports from Any Country that has Not Implemented Identical Feed Restrictions and That has Not Enforced Such Restrictions for at Least as Long as the United States.

It appears that Canada's feed ban implemented in 1997 exempts "rendered animal fat from all species" from its list of prohibited feeds.²⁷ The United States' feed ban, however, does not include this exemption.²⁸ In addition, Canada

²⁶ Id. at 7.

²⁷ Canada: A Minimal BSE Risk Country, Canadian Food Inspection Agency, Animal Products, Animal Health and Production Division, October 2003.

²⁸ 21 CFR 589.2000, Animal Proteins Prohibited in Ruminant Feed, at 541.

continues to allow the feeding of mammalian blood to ruminant animals.²⁹ The United States is finalizing more stringent regulations to prohibit the feeding of mammalian blood and blood products to ruminants,³⁰ and to prohibit poultry litter and plate waste from ruminant feed.³¹ APHIS is silent on whether Canada has any plans to modify its feed ban so as to be in compliance with the United States feed ban.

It further appears that Canada has only prohibited the practice of including beef derived from downer animals in export approved facilities.³² APHIS is silent on whether Canada has any plans to adopt the additional restrictions proposed by the FDA to ban “any material from nonambulatory or dead cattle, as well as SRM and mechanically separated beef, from FDA-regulated human food, including dietary supplements and cosmetics.”³³

Under no circumstances should the United States accept any cattle, beef, or beef products from countries that do not maintain identical or more stringent safeguard measures than is presently required or presently proposed in the United States and which measures have been enforced for at least as long as the United States’.

7. The Proposed Rule Establishes a Deceptively Named “BSE Minimal Risk Region” That Does Not Comply With the Scientifically Established and Internationally Accepted BSE Risk Classifications of the World Organization for Animal Health or Office International des Epizooties (OIE).

According to the OIE’s BSE risk classification standards, Canada became ineligible for a “BSE provisionally free” classification upon the first discovery of BSE in a native Canadian cow on May 20, 2003. As a result of this case, Canada can achieve no higher than a “BSE moderate risk” classification because it does not meet the “BSE minimal risk” classification requirement that a country with a native case of BSE must have had its feed ban in place for 8 years before being

²⁹ Canadian Food Inspection Agency’s (CFIA) Feed Ban, Canadian Food Inspection Agency, Animal Products, Animal Health and Production Division, available at <http://www.inspection.gc.ca/english/anima/feebet/rumin/ruminfse.shtml>, downloaded March 10, 2004.

³⁰ Explanatory Note: Risk Analysis: BSE Risk of Importation of Designated Ruminants and Ruminant Products from Canada into the United States, USDA Animal Plant Health Inspection Service, Veterinary Services, February 2004, at 4.

³¹ www.hhs.gov/news/press/2004pres/20040126.html

³² Id. at 8.

³³ Id. at 5.

upgraded to the "BSE minimum risk" classification. Thus, Canada will be recognized by the international community as no better than a "BSE moderate risk" country for approximately 1 ½ years because Canada's feed ban was not implemented until late 1997.

Nevertheless, in order to enable imports of Canadian cattle and beef products, USDA APHIS has proposed regulations that, although called "BSE Minimal Risk Region," do not comply with the OIE standards for "country or zone with a minimal BSE risk."³⁴ USDA has not provided any analysis of the impact of granting any other countries besides Canada BSE minimal risk status under the proposed rule. Nevertheless, the race for the new status is already on. In addition to Canada, two other countries, Finland and Norway, which are currently listed by USDA, respectively, as "a country affected with BSE" and "a country with substantial risk associated with BSE," have already petitioned USDA for recognition as "BSE minimal risk" regions.³⁵ Although R-CALF USA is not surprised that these applications have been submitted, there is no basis for USDA or APHIS to consider the applications and urges that they be rejected.

The APHIS proposal to designate Canada as a minimal risk region, therefore, is not based on any internationally accepted scientific standards and should be withdrawn.

8. By Unilaterally Designating Canada as a Minimal Risk Region in Direct Contradiction of the Internationally Accepted and Scientifically Established OIE Risk Categories, APHIS Will Cause Direct Economic Harm to the U.S. Cattle Industry.

The five BSE risk classifications established by the OIE are used by over 164 World Trade Organization (WTO) member countries to evaluate the relative BSE risks associated with importing ruminant and ruminant products from various countries. Many countries, including the United States, have elected not to assume the BSE risks associated with importing from countries that cannot meet the eligibility standards for an OIE BSE Free or BSE Provisionally Free classification. Common sense suggests that as a country's BSE risk increases, fewer countries will be willing to assume the greater risk of importing from that country if similar products are available from countries harboring a lesser BSE

³⁴ OIE Terrestrial Animal Health Code 2.3.13.5.

³⁵ See comments of Ministry of Agriculture and Forestry, Department of Food and Health, Finland (December 29, 2003) and Norway's Application for Being Recognized By the USDA as a "Minimal BSE Risk Country."

risk. Indeed, many countries currently refuse to accept imports of beef from the U.S. as a direct result of the discovery of the two BSE-infected Canadian cows in 2003.

The proposed rule unilaterally creates the so called "BSE minimal risk region" and, by doing so, characterizes Canada as having less risk than it would have under the classifications established by the OIE. Countries that import U.S. cattle and beef, however, are not likely to be fooled by APHIS's semantic trick. These countries all recognize that the United States is currently importing beef from Canada, a country with a higher BSE risk than they would be willing to assume. Consequently, since September 2003, after USDA partially lifted the May 20, 2003 ban on imports of Canadian beef, both Japan and South Korea have stopped importing United States beef. Japan and Korea have refused to resume beef imports from the United States until all beef products destined for these countries are labeled to guarantee that they do not contain any beef derived from Canadian cattle. It is important to note that both Japan and South Korea, our first and third largest beef export customers, respectively, have maintained this export restriction after APHIS published the proposed rule on November 4, 2003. More recently, despite intense pressure from the U.S. government, including USDA, Japan and Korea have continued to ban imports of U.S. beef. It is clear, therefore, that if the proposed rule is adopted in an attempt to reclassify Canada as having a more favorable risk designation than is recognized by the OIE, export markets for U.S. beef products will continue to be severely limited by importing countries such as Japan and Korea. On the other hand, as noted above, countries with BSE risks will clearly try and use the proposed rule to gain access to U.S. markets for their cattle and beef exports.

As evidenced by the approximate 20 percent reduction in U.S. cattle prices following the export restrictions placed on the United States by approximately 90 percent of our beef export customers, actions that cause restrictions on U.S. beef exports translates to lost revenues for live cattle producers. APHIS should withdraw its proposed rules to prevent additional harm to U.S. producers.

9. If the Proposed Rule is not Withdrawn, The Restriction that Limits Imported Fresh Meat to Bovines that were Less Than 30 Months of Age Must be Maintained Until the Risk of Eliminating the Age Restriction is Fully Assessed

Section 94.19 of the proposed rule would have restricted the importation of fresh (chilled or frozen) meat to bovines less than 30 months of age at the time of slaughter. That restriction arose out of APHIS' Risk Analysis, which placed

great importance on the age restriction as a risk reduction method. In fact, the age restriction was considered to be so important that in the Risk Analysis APHIS contemplated requiring CFIA to certify that the animals were less than 30 months of age at the time of slaughter and that they were slaughtered in a facility that only kills bovinds less than 30 months of age (or complies with a facility segregation procedure approved by CFIA and endorsed by APHIS).³⁶ In sum, the entire Risk Analysis for the provision in the Proposed Rule permitting the importation of these materials is based on the existence of an age restriction.

While it was not obvious from a quick review, the March 8, 2004, Federal Register notice did more than reopen the comment period for the proposed rule. In fact, it made a significant, substantive change to the rule -- it eliminated the age restriction on imported beef from BSE-minimal risk regions.

APHIS noted that FSIS does not restrict the slaughter of cattle in the U.S. based on the age of the animal. Apparently based on that fact alone, APHIS concluded:

We now believe it would not be necessary to require that beef imported from BSE minimal-risk regions be derived only from cattle less than 30 months of age, provided equivalent measures are in place to ensure that SRM's are removed when the animals are slaughtered, and that such other measures as are necessary are in place. We believe such measures are already being taken in Canada.³⁷

APHIS knew that FSIS does not have age restrictions on U.S. beef prior to publishing the Proposed Rule in November 2003. The fact that BSE has been identified in Canadian cows provides a legitimate basis for imposing restrictions on Canadian beef that are not imposed on U.S. beef. However, with the only intervening event since the publication of the Proposed Rule being the discovery of a second Canadian cow infected with BSE, APHIS, with minimal discussion or justification, has decided to drop the age restriction on imported beef. APHIS has simply not articulated a rational basis for doing so.

Even assuming *arguendo* that there is a rational basis for dropping the age restriction on imported beef, APHIS has not provided the public a meaningful opportunity to comment on the new proposal. As an initial matter, as discussed above, the entire Risk Analysis is predicated on the age restriction. A new risk

³⁶ Risk Analysis at 28.

³⁷ 69. Fed. Reg., at 10,653.

analysis, without the age restriction, would have to be done and the public would have to be given an opportunity to review and comment on that risk analysis. Second, the analysis of the proposed rule required by Executive Order 12866 would have to be re-done since the current analysis expressly contemplates the age restriction. Finally, the language of the new "proposal" in the March 8 notice is too vague to be able to provide meaningful comment. What does "provided *equivalent measures* are in place to ensure that SRM's are removed when the animals are slaughtered, and that *such other measures as are necessary* are in place" mean? Will those terms be defined?

Although R-CALF opposes the proposed rule and calls on APHIS to withdraw it, if the rule is adopted, the age restriction on imported meat must be maintained until a new risk analysis incorporating any proposed change to the age restriction is completed and the public is given a meaningful opportunity to review and comment on the proposed change.

10. The Economic Analysis Prepared by APHIS Fails To Analyze the Full Effect of the Proposed Rule

The Economic Analysis prepared by APHIS to analyze the cost-benefit effects of the proposed rule is extremely limited and does not begin to measure the true impact of allowing imports from Canada. Dr. John J. VanSickle, Director of the International Agricultural Trade and Policy Center of the University of Florida, prepared an evaluation of the APHIS Economic Analysis.³⁸ Dr. VanSickle, a nationally recognized expert on agricultural markets has conducted a thorough review of the modeling that underlies the APHIS Economic Analysis. Based on his review, Dr. VanSickle's concludes "The USDA economic analysis of this proposed rule falls short of estimating the larger economic impacts this rule could have on the U.S. economy as it provides only a limited analysis of the effect of imports of Canadian cattle and beef on prices in the U.S."³⁹

The USDA economic analysis only considers the cost effects of increased supplies of beef and cattle resulting from imports of and their economic impacts on the domestic market. According to Dr. VanSickle, "The USDA analysis ignores the impacts this rule will have on associated industries and their

³⁸ J.J. VanSickle, Ph.D., Economic Analysis of Proposed Rule for Bovine Spongiform Encephalopathy: Minimal Risk Regions and Importation of Commodities (APHIS Docket No. 03-080-1) ("VanSickle Analysis"). The VanSickle Analysis is attached to these comments as Exhibit B.

³⁹ Id. at 1.

productive output, and it ignores the impact it will have on employment."⁴⁰ Furthermore, the USDA Economic Analysis, which was prepared after the first BSE-infected Canadian cow was discovered in May 2003 but before the second BSE-infected Canadian cow was identified on December 23, 2003, ignores any costs associated with events such as discovery of additional BSE cases or human cases of vCJD. In Dr. VanSickle's opinion, such events could have catastrophic effects on the U.S. cattle market. Dr. VanSickle states "Estimates of the cost of the 1986 outbreak on the British economy, with a herd size of 12.04 million head, are \$5.8 billion. Given that the United States herd size is eight times larger, a worst case scenario suggests the impacts on the U.S. could be as large as \$46.4 billion."⁴¹

11. The Proposed Rule Ignores the Economic Risks Associated with the Known and Measurable Costs Previously Reported by Countries like Canada that have Identified BSE in their Cattle Herds.

Dr. VanSickle points out that the "[e]xperience of BSE in the European Union indicates that major categories of costs from a BSE introduction include agriculture, food consumption, trade and tourism." Despite the known susceptibility of these cost categories, the USDA Analysis only considered the costs of increased beef and cattle supplies and their impact on the domestic market. The VanSickle study shows that the cost of the BSE introduction in the UK totals over \$5.8 billion today, resulted in a 40 percent decline in beef consumption the first year, households cut their consumption 26 percent, and the long-run demand for beef and veal declined 4.5 percent.⁴²

At a minimum, the USDA should have attributed the portion of these known and measurable costs to the risks associated with resuming imports from a country that, like the UK, has identified BSE in its cattle herds. Dr. VanSickle's identification of these historical impacts demonstrates that the risks associated with the Proposed Rule "go beyond the simple supply impact if BSE is introduced."

⁴⁰ Id.

⁴¹ Id.

⁴² Id. at 3.

12. The Proposed Rule Ignores the Fundamental Consequences of a Change in Industry Output on the Overall Economy that would Result from Resuming Cattle and Beef Imports from Canada.

Dr. VanSickle's Analysis reveals that the overall impact on the economy is far greater than that estimated by the USDA because the USDA modeling did not include applicable industry multipliers to capture the total economic impacts resulting from the Proposed Rule.⁴³ To model total economic impacts, Dr. VanSickle used standard Implan multipliers that recognize that a \$1 decline in sales for the cattle and farming sector will have a \$3.87 impact on total output in the economy.⁴⁴ Different multipliers were used for the impacts on related jobs, the meat processing sector, and employment.

Dr. VanSickle's modeling shows that the proposed rule would impact the economic output of the cattle industry. Based on his modeling using Implan multipliers, Dr. VanSickle found that:

- output by \$701.5 million and cost the economy 7,883 jobs;
- allowing fed cattle imports from Canada would impact total economic output by \$1.7 billion and cost the economy 19,358 jobs;
- imports of beef resulting from this proposed rule would impact total economic output by \$5.8 billion and cost the economy 50,874 jobs and;

loss of exports as a result of this rule would impact total economic output by \$16.1 billion and cost the economy 140,068 jobs.⁴⁵

13. The Proposed Rule Fails to Address the Probable Consequences Lower Prices Would have on a Cyclical Cattle Industry Experiencing a Prolonged State of Contraction.

While the USDA economic evaluation of the Proposed Rule acknowledges negative price impacts for both feeder cattle and fed cattle, it fails to take into account the impact these lower prices would have on the U.S. cattle industry. Dr. VanSickle determines that there are "large consequences for the U.S. cattle industry" and lower cattle prices "will force many [cattle producers] to downsize or exit the beef production business."⁴⁶

⁴³ Id. at 3.

⁴⁴ Id. at 4.

⁴⁵ Id at 4-5.

⁴⁶

The consequences Dr. VanSickle predicts and the damage such consequences will likely inflict upon the overall economy become apparent upon a review of the current state of the U.S. live cattle industry. Live cattle production comprises the single largest sector of U.S. agriculture, contributing over \$40 billion annually to the United States economy.⁴⁷ Cattle are raised in all fifty states and half of all U.S. farms have beef cattle as part of their operations.⁴⁸ Given its size and revenue potential, the live cattle industry is of paramount importance to the United States economy and to the economy of rural America in particular.

U.S. cattle producers, and by extension America's rural communities, are experiencing a historically difficult period. The U.S. cattle herd underwent its eighth consecutive year of contraction in 2003.⁴⁹ This eight years of liquidation is unprecedented, and it extends the current cattle cycle to fourteen years, which is also unprecedented.⁵⁰ Normal cattle cycles last approximately ten years from peak to peak, *i.e.*, from herd contraction to herd rebuilding.⁵¹ As opposed to the current liquidation phase of eight years, the average liquidation phase of cattle cycles is two to three years.⁵² In 2002, the USDA predicted that by January 1, 2003, the U.S. cattle population would fall to 95.6 million, its lowest number since 1959.⁵³ However, by January 1, 2003, the U.S. cattle population had fallen even further to 95.1 million head and by January 1, 2004, to 94.9 million head.⁵⁴ Also in 2002, the USDA estimated that the U.S. calf crop in 2003 would be the smallest since the mid-1950s.⁵⁵

During this protracted herd liquidation, the U.S. cattle industry lost an average of 13,646 beef cattle operations each year. There are 805,080 beef cow

⁴⁷ USDA, ERS, *U.S. farm sector cash receipts from sales of agricultural commodities, 2000-2004F* found at http://www.ers.usda.gov/Briefing/FarmIncome/Data/cr_t3.htm.

⁴⁸ U.S. Department of Agriculture, *Where's the Beef? Small Farms Produce Majority of Cattle, Agricultural Outlook*, December 2002, at 21.

⁴⁹ U.S. Department of Agriculture, *U.S. Cattle Inventory*, (Jan. 2004), available at <http://usda.mannlib.cornell.edu/reports/nassr/livestock/pct-bb/cat10104.txt>, retrieved April 7, 2004.

⁵⁰ *Herd Rebuilding is Still Uncertain, Cattle Buyers Weekly*, January 27, 2003, at 1.

⁵¹ U.S. International Trade Commission, *Live Cattle from Canada and Mexico*, Inv. Nos. 701-TA-386 (Preliminary) and 731-TA-812-813 (Preliminary), Pub. No. 3155, February 1999, at 24.

⁵² *Id.*

⁵³ U.S. Department of Agriculture, *World Beef Trade Overview*, October 17, 2002, available at <http://www.fas.usda.gov/dlp/circular/2002/02-10LP/beefoverview.html>, retrieved January 8, 2003.

⁵⁴ Cattle, U.S. Department of Agriculture, National Agricultural Statistics Service, January 30, 2004, available at <http://usda.mannlib.cornell.edu/>, retrieved April 6, 2004.

⁵⁵ *Id.*

operations remaining in the U.S.⁵⁶ U.S. cattle operations form the backbone of rural America and are vital in maintaining and supporting local schools, hospitals, nursing homes, and communities. Collectively, these businesses are one of the most significant segments of the U.S. gross national product and their decline should evoke national concern.

The average returns to U.S. cow/calf producers during the 1992-2001 decade had fallen to an alarming level. Returns for cow/calf producers were actually a *negative* \$30.40 per bred cow per year during 1992-2001.⁵⁷ While 2003 saw cattle prices rise significantly due to the outbreak of BSE in Canada in May and the resulting closing of the Canadian border, that period of "boom" prices is already over. Cattle prices in December 2003 rose to \$93 cwt which was significantly higher than the \$72-73 cwt baseline average used for beef cattle by USDA from 1990-92.⁵⁸ However, the cattle industry faces a significant challenge as virtually all export markets have been closed to U.S. beef exports due to the discovery of BSE in an imported Holstein cow in Washington State. USDA predicts that cattle prices will fall significantly in 2004, back down to the depressed level of \$72 cwt.⁵⁹ Indeed, cattle prices in January and February have already eroded, hovering in the high 70s.⁶⁰ The return of these unsustainably low cattle prices signifies that the industry is returning to the crisis position that characterized most of the past twelve years.

Commensurate with low cattle prices, the average net income for United States beef cattle operations during the years 1998 through 2002 was only \$14,700.⁶¹ However in 2001 and 2002, the net incomes fell to \$12,200 and

⁵⁶ Number of All Cattle and Beef Cow Operations, 1988-2002, National Agricultural Statistics Service-USDA, Cattle Graphics, available at http://www.usda.gov/nass/aggraphs/acbc_ops.htm, retrieved on April 6, 2004.

⁵⁷ U.S. Cow-Calf Production Cash Costs and Returns, 1990-95; 1996-99; 2000-2001, Economic Research Service/USDA, available at <http://www.ers.usda.gov/data/farmincome/CAR/DATA/Appendix/Cowcalf/US9095.xls>; <http://www.ers.usda.gov/data/farmincome/CAR/DATA/History/CowCalf/US9699.xls>; and <http://www.ers.usda.gov/data/CostsAndReturns/data/current/C-Cowc.xls>, retrieved from the internet on October 18, 2002.

⁵⁸ USDA, NASS, *Agricultural Prices*, at 9 (Dec. 31 2003) found at <http://usda.mannlib.cornell.edu/reports/nassr/price/pap-bb/2003/agpr1203.pdf>.

⁵⁹ USDA, ERS, *World Agricultural Outlook, Livestock*, Jan. 12, 2004.

⁶⁰ USDA, NASS, *Agricultural Prices*, at 20 (Feb. 27, 2004) found at <http://usda.mannlib.cornell.edu/reports/nassr/price/pap-bb/2004/agpr0204.pdf>.

⁶¹ Agriculture Income and Finance Outlook, U.S. Department of Agriculture, Economic Research Service, AIS-81, November 5, 2003, at 6, available at <http://usda.mannlib.cornell.edu/reports/erssor/economics/ais-bb/2003/ais81.pdf>, retrieved April 6, 2004.

\$12,100, respectively.⁶² The ongoing and systematic destruction of the U.S. cattle industry can be attributed to forces that systematically produce prices that are too low to sustain independent producers.

Not only does the USDA analysis ignore the effect lower cattle prices would have on the overall U.S. economy, Dr. VanSickle reports that USDA erred in its characterization of the economic relationship between the feeder and fed cattle sectors, resulting in an under-reporting of producer financial losses. While the USDA claims its estimated losses to the feeder sector and fed sector of \$182 million and \$448 million, respectively, are independent and further mitigated because losses to the feeder sector would translate into benefits for the fed sector, Dr. VanSickle suggests that these losses are additive, “implying that opening the border to trade with Canada on fed cattle and feeder cattle would likely have an effect of more than \$630 million.”

14. The Proposed Rule Fails to Properly Account for the Import Sensitive Nature of the U.S. Cattle Industry.

The USDA claims the price declines associated with the Proposed Rule would largely reflect a return to the more normal market conditions that prevailed before Canada’s BSE discovery.⁶³ But Dr. VanSickle reveals that the U.S. cattle industry is already weakened and the loss associated with the Proposed Rule would be difficult to recover.

In addition to the previous discussion regarding the ongoing constriction of the U.S. cattle industry, the import sensitive nature of the industry itself helps explain how circumstances preceding the Canadian BSE discovery, including trade with Canada, have contributed to the weakened condition of the U.S. cattle industry that Dr. VanSickle described.

The live cattle industry is highly sensitive to changes in the volume of beef in the market due to the disproportionate impact of changes in supply on prices. According to Chuck Lambert, formerly of the National Cattlemen’s Beef Association (NCBA) and currently Deputy Under Secretary for USDA’s Marketing and Regulatory Programs, increased imports of beef have reduced returns to U.S. cattle producers: “[t]he rule of thumb is that a 10% increase in beef

⁶² *Id.*

⁶³ Economic Analysis Proposed Rule Bovine Spongiform Encephalopathy: Minimal Risk Regions and Importation of Commodities (APHIS Docket No. 03-080-3), USDA Animal and Plant Health Inspection Service (October 24, 2003), at 8.

supply results in a 15% to 20% decrease in price.”⁶⁴ Even small increases in supply – as little as 2 to 3 percent – can have significant downward effects on price.⁶⁵

While increased imports of both beef and cattle contribute to increased supplies, which directly lower cattle prices, imports also function to restrain price increases. This issue was specifically addressed by the Republican Commissioners of the United States Trade Deficit Review Commission in their November 14, 2000, report. The Republican Commissioners stated, “Easy availability of imports can limit price increases either by expanding available supply or reducing the ability of businesses to raise prices in order to pass on increases in their costs.”⁶⁶

Thus, increased cattle and beef imports can significantly reduce the price received by U.S. cattle producers and restrain price increases. Annual imports of fresh, chilled and frozen beef into the United States rose from \$1.5 billion and 2.1 billion pounds in 1995 to \$2.5 billion and 3 billion pounds in 2000.⁶⁷ In addition, other factors -- such as the declining share of the retail dollar passed on to U.S. producers -- have already injured the U.S. cattle industry, and increased imports would only exacerbate the already precarious position of U.S. producers.

Change in the supply of beef has long been recognized as an important factor affecting prices for live cattle. Nearly 40 years ago Congress recognized that increased imports of beef were having a negative effect on domestic beef prices and hence on the U.S. cattle industry. Quoting from the Senate Finance Committee’s report which accompanied the Meat Import Act of 1964, Congress observed:

“Th[e] price data strongly suggests imported meat has played an important part in creating the distressed market conditions in the cattle industry. The pressure on domestic prices of low-priced, foreign imported beef discourages sale of domestic livestock and

⁶⁴ Chuck Lambert, Chief Economist, NCBA, *Beef Today*, (Sept. 1997).

⁶⁵ See Sparks Companies Inc., “Potential Impacts of the Proposed Ban on Packer Ownership and Feeding of Livestock”, A Special Study, (March 18, 2002) at 37 (“In general, prices decrease 1% for each 0.6% increase in beef production (consumption = production for beef).”)

⁶⁶ United States Trade Deficit Review Commission, Report of “The U.S. Trade Deficit: Causes, Consequences and Recommendations for Action,” (November 14, 2000), Chapter 2 – Republican Commissioners’ Views – Causes, at 26, Obtained from the Internet at www.ustrdc.gov/reports/finalrept-contents.html.

⁶⁷ U.S. Agricultural Imports Head Higher, [Agricultural Outlook](#) (U.S. Dept. of Agriculture), August 2000, at 5.

encourages their return to the range where they produce new calves and add more weight, thus intensifying the problems confronting the American cattlemen. . . . On the basis of information presented to the committee, . . . your committee has concluded that beef imports have contributed heavily to the depressed conditions in the livestock industry”⁶⁸

In particular, trade with Canada in the years before the first BSE discovery in a Canadian cow was a virtual one-way street marked by a progressively increasing supply of price-depressing Canadian beef and cattle shipments that increasingly overshadowed the relatively small volumes of U.S. beef or cattle exports to Canada.

The United States – Canadian Free Trade Agreement (USCFTA) was implemented in 1989,⁶⁹ and this agreement was completely phased in on January 1, 1998.⁷⁰ The North American Free Trade Agreement (NAFTA) went into effect on January 1, 1994, and incorporated the USCFTA.⁷¹ The terms of the USCFTA were folded into NAFTA. Prior to the USCFTA, imports of Canadian cattle into the United States basically remained flat and averaged 368,000 head per year from 1978 to 1988.⁷² Following the implementation of the USCFTA, imports of Canadian live cattle into the United States increased substantially. As noted by the USDA in 1989, U.S. imports of Canadian cattle began a “fluctuating, but generally strong upward trend” with imports that year totaling 585,000 head.⁷³ During the five years preceding 2003, imports of Canadian cattle have averaged 1,251,217 head annually.⁷⁴

Due to alleged sanitary threats, U.S. exports of live cattle to Canada are restricted. But a post-NAFTA agreement, the Northwest Pilot Program, has led to increased exports of U.S. cattle to Canada when certain sanitary conditions are

⁶⁸ S. Rep. No. 88-1167, (1964), reprinted in 1964 U.S.C.C.A.N. at 3074.

⁶⁹ U.S. Department of Agriculture, Foreign Agricultural Service, *FAQ's Regarding U.S. Cattle and Beef Imports from Canada*, available at <http://www.fas.usda.gov/dlp/Canada/questions.htm>, retrieved on February 11, 2003.

⁷⁰ U.S. Department of Agriculture, Economic Research Service, *Effects of North American Free Trade Agreement on Agriculture and the Rural Economy*, WRS-02-1, July 2002, at v.

⁷¹ *Id.*

⁷² U.S. Department of Agriculture, Foreign Agricultural Service, *FAQ's Regarding U.S. Cattle and Beef Imports from Canada*, available at <http://www.fas.usda.gov/dlp/Canada/questions.htm>, retrieved on February 11, 2003, at 2.

⁷³ *Id.*

⁷⁴ *Source*: Livestock, Dairy and Poultry Outlook Reports, U.S. Department of Agriculture, Economic Research Service.

met. U.S. shipments of live cattle to Canada grew from 40,000 head in 1996 to 349,536 head in 2000.⁷⁵ While U.S. exports of live cattle to Canada have increased slightly following NAFTA, averaging 224,199 head annually during the five years preceding 2003, imports of live cattle into the United States from Canada greatly overshadow export gains by the United States.⁷⁶ The United States cattle trade deficit with Canada averaged 1,027,018 head annually for the five years preceding 2003.⁷⁷

U.S. imports of beef from Canada increased markedly in the years following the implementation of the USCFTA, growing from 222.4 million pounds in 1990⁷⁸, to 823 million pounds in 1998⁷⁹, to 1.1 billion pounds in 2002.⁸⁰ During the five years preceding 2003, the average annual amount of beef imported from Canada was 933 million pounds.⁸¹

During this same period of time (1990-2002), U.S. exports of beef to Canada essentially remained flat with the United States shipping 191 million pounds in 1990,⁸² 261 million pounds in 1998,⁸³ and only 241 million pounds in 2002.⁸⁴ During the five years preceding 2003, the average annual amount of beef exported to Canada was 248 million pounds.⁸⁵ The United States beef trade deficit with Canada averaged 685 million pounds annually for the five years preceding 2003.

⁷⁵ U.S. Department of Agriculture, Economic Research Service, *Effects of North American Free Trade Agreement on Agriculture and the Rural Economy*, WRS-02-1, July 2002, at 57.

⁷⁶ *Source*: Livestock, Dairy and Poultry Outlook Reports, U.S. Department of Agriculture, Economic Research Service.

⁷⁷ *Id.*

⁷⁸ Table 45c, U.S. Beef Imports from Canada, Redmeat Yearbook, U.S. Department of Agriculture, Economic Research Service, available at <http://www.ers.usda.gov/data/sdp/view.asp?f=livestock/94006/>, retrieved on April 6, 2004.

⁷⁹ *Id.*

⁸⁰ Livestock Dairy and Poultry Outlook, LDP-M-17, U.S. Department of Agriculture, Economic Research Service, March 23, 2004, at 22, available at <http://www.ers.usda.gov/publications/ldp/Mar04/LDPM117E.pdf>, retrieved on April 6, 2004.

⁸¹ *Source*: Livestock, Dairy and Poultry Outlook Reports, U.S. Department of Agriculture, Economic Research Service.

⁸² Table 53b, U.S. Beef Exports to Canada, Redmeat Yearbook, U.S. Department of Agriculture, Economic Research Service, available at <http://www.ers.usda.gov/data/sdp/view.asp?f=livestock/94006/>, retrieved on April 6, 2004.

⁸³ *Id.*

⁸⁴ Livestock Dairy and Poultry Outlook, LDP-M-17, U.S. Department of Agriculture, Economic Research Service, March 23, 2004, at 22, available at <http://www.ers.usda.gov/publications/ldp/Mar04/LDPM117E.pdf>, retrieved on April 6, 2004.

⁸⁵ *Source*: Livestock, Dairy and Poultry Outlook Reports, U.S. Department of Agriculture, Economic Research Service.

The period preceding Canada's first BSE case described by the USDA as reflecting "more normal market conditions" was far from normal. From 1999 to 2004, the United States cattle herd fell from 98.5 million head to 94.9 million head,⁸⁶ while the Canadian cattle herd increased from 12.8 million head to 14.7 million head.⁸⁷ Thus, during this protracted period of U.S. herd constriction in the face of a mounting global trade deficit, the majority of which is attributable to Canadian imports, Canada was expanding its production capacity and was poised to continually capture an increasing share of the U.S. market, thereby supplanting the U.S. production capacity with foreign product.

15. Profits to Beef Packers, But Not to Cattle Producers

The U.S. beef sector has undergone significant changes in recent years. The U.S. beef packing industry has become heavily concentrated with just four firms controlling a combined 80 percent of the market.⁸⁸ Benefits to U.S. live cattle producers in the form of expanded markets for beef abroad have been heavily outweighed by the ability of packers to use imported cattle and beef to drive down prices received in the U.S. cattle market. This situation is most notable with the dramatic increase in imports of live cattle and beef from Canada following the implementation of the USCFTA/NAFTA.

16. Concentrated Packer Sector Has Benefited from Increased Cattle and Beef Imports

Packers are able to capture benefits from both increased imports and exports. Packers add value to live cattle and/or beef carcasses through processing and sell the resulting boxed beef and other beef products on a margin basis. To the extent that packers have access to an expanded supply of inventories, *i.e.*, a new source of imported inventories, packers are afforded new alternatives for sourcing lower-cost inventories. Lower inventory costs mean higher profits for

⁸⁶ United States and Canadian Cattle, U.S. Department of Agriculture, National Agricultural Statistics Service, Mt An 8 (2-99), available at <http://usda.mannlib.cornell.edu/reports/nassr/livestock/uscc/uscc0299.txt>, retrieved on April 7, 2004.

⁸⁷ United States and Canadian Cattle, U.S. Department of Agriculture, National Agricultural Statistics Service, Mt An 8 (2-99), available at <http://usda.mannlib.cornell.edu/reports/nassr/livestock/uscc/uscc0204.txt>, retrieved on April 7, 2004.

⁸⁸ Richard J. Sexton, *Market consolidation poses challenges for food industry*, California Agriculture, Vol. 56, No. 5, September-October 2002, at 146.

margin operators like packers and, therefore, packers have an economic incentive to seek new sources of lower cost inventories.

In addition, packers benefit from oversupply conditions as oversupplies lower domestic live cattle prices, hence the cost of their inventories. As discussed previously, the live cattle industry is highly sensitive to changes in the available supply of both beef and live cattle, a function of the perishable nature of both beef and live cattle. Thus, the very factors that benefit packers -- lower prices for live cattle and increased availability of beef supplies -- result in harm to cattle producers as cattle producers receive lower prices for their cattle, and their live cattle markets respond negatively to increased supplies.

This situation helps to explain how there is a negative correlation between profit margins at the packing and feeding stage, with the feeding stage representing the final phase of the live cattle industry, as was found in the 2002 study by Sparks Companies, Inc.⁸⁹ Although the packer is the customer of the live cattle producer, the packer is in direct competition with the producer over the price paid for live cattle. Unfortunately, the structural changes that have occurred within the U.S. cattle market, *i.e.*, the unprecedented concentration of the packing industry,⁹⁰ have afforded packers the ability to distort the outcome of that competition, and imports are a significant contributor to this distortion.

Thus, to the extent that reopening the Canadian border increases imports of cattle and beef, such imports will have a direct impact on the prices that cow-calf operators and ranchers receive for their cattle. Bear in mind as well that the cattle industry has been through and is continuing to experience an unprecedented eight-year period of contraction and liquidation, and higher relative prices are needed in order to rebuild the precariously diminished production capacity of this important domestic industry.

17. The Lack of Relationship between Live Cattle Prices and Retail Beef Prices

Consumers have not experienced a reduction in the price of retail beef that a competitive market would predict when the input costs associated with the final

⁸⁹ *See id.* at 24.

⁹⁰ U.S. General Accounting Office, *Economic Models of Cattle Prices: How USDA Can Act to Improve Models to Explain Cattle Prices*, GAO-02-246, March 2002 at 51. In reference to beef packer concentration, the GAO stated, “[N]o other manufacturing industry showed as large an increase in concentration since the U.S. Bureau of the Census began regularly publishing concentration data in 1947. . .”

product are drastically reduced, i.e., lower priced cattle resulting from increased imports. This fact is readily apparent upon review of the long-term data compiled by the USDA's Economic Research Service.

During the 10-year period from 1993 to 2002, live cattle prices fell from \$.77 per pound to \$.67 per pound, a \$.10 per pound price decrease, representing a loss to producers of \$125 per animal.⁹¹ This represents a 12 percent cattle price decrease over 10 years.

During this same 10-year period, choice beef retail values increased from \$2.93 per pound to a near record \$3.32 per pound, a \$.39 per pound retail price increase, representing an increased food cost to consumers of \$195 per live animal equivalent.⁹² This represents a 13 percent retail beef price increase over 10 years.

The following is an excerpt from the July 16, 2002 written testimony of Herman Schumacher, Director, R-CALF USA, before the United States Senate Committee on Agriculture, Nutrition, and Forestry Hearing on the Proposed Ban on Packer Ownership of Livestock and USDA's Enforcement of the Packers and Stockyards Act:

Let me close by saying the producers in North Dakota, South Dakota, Nebraska, and many other western states are suffering from a severe drought. My grandfather weathered droughts in South Dakota because he had a competitive market with which to recover a fair value for his cattle. The last severe drought we went through in our state was 1988. We culled our herd and sold cull cows for \$50 per cwt. Retail beef prices that year were \$2.50 per pound. In today's drought we are selling our cull cows into a market that will only return \$35 per cwt (\$180 less per head than in 1988). But today's retail beef prices are \$3.31.

⁹¹ Economic Research Service-USDA, Choice Beef Values and Spreads and All-Fresh Retail Value, obtained from the Internet at <http://www.ers.usda.gov/Briefing/FoodPriceSpreads/meatpricespreads/beef.xls>, on March 12, 2003.

⁹² Id. See also Retail Price Spreads, Redmeat Yearbook, 1970-2000, United States Department of Agriculture – Economic Research Service, available at <http://www.ers.usda.gov/data/sdp/view.asp?f=livestock/94006/>, downloaded on March 31, 2004.

The following is a quote from Leo McDonnell, Jr., President, R-CALF USA excerpted from the December 28, 2002 news release issued by R-CALF USA:

The fed cattle to retail spread for the previous three years has averaged \$1.50 per pound. This year the fed cattle to retail spread just though October averaged \$1.90 per pound. If prices were reflective of retail value, then we should have seen fed cattle in the \$80 per cwt range instead of the present \$60 per cwt range.

Thus the USDA's assumption that consumers would benefit from lower priced cattle resulting from increased Canadian imports is not supported by the preponderance of relevant data compiled by the USDA's Economic Research Service. Instead, this data shows the price consumers pay for beef has little or no relation to the price producers receive for their cattle. The chart attached at Exhibit C depicting the relationship between live cattle prices and retail prices reveals that this lack of relationship is not an anomaly, but rather, it is a persistent trend manifest since 1979.

18. The Proposed Rule Does Consider Not Recent Government Subsidies to the Canadian Cattle Industry

Moreover, the USDA failed to recognize or otherwise mention the costs of the significant government price support Canada has provided to assist its cattle industry in responding to BSE. The following government programs are listed on the Canadian Food Inspection Agency Website:

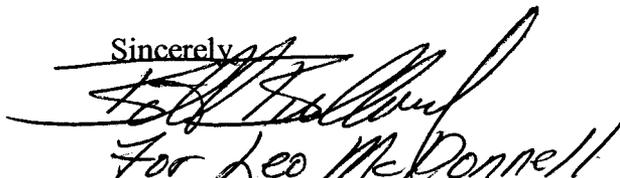
Canadian BSE Recovery Program:	\$520 million
Work Sharing Program:	\$9.4 million
Producers Assistance 2003:	Unknown
Cull Animal Program:	\$200 million
Transitional Industry Support Program:	\$930 million
Business Risk Management Transition Funding:	\$1.2 billion ⁹³

Further, the USDA failed to consider the potential impact these government support programs may have in affording Canadian cattle and beef a subsidy-related advantage upon entry into the United States market.

⁹³ http://www.agr.gc.ca/cb/index_e.php?s1=b&s2=2004&page=bse-esb

R-CALF USA appreciates the opportunity to submit these comments to APHIS.

Sincerely



For Leo McDonnell
Leo McDonnell
President

**Evaluation of the Adequacy and Appropriateness of Risk Analysis Used
by the U.S. Department of Agriculture Animal and Plant Health
Inspection Service in Support of Proposal to List Canada as a Bovine
Spongiform Encephalopathy Minimal Risk Region**

Louis Anthony Cox, Jr., Ph.D.

INTRODUCTION

This document assesses USDA's October 2003 report¹ titled: "Risk Analysis: BSE Risk from Importation of Designated Ruminants and Ruminant Products from Canada into the United States" (the "Risk Analysis"), and the February 2004 "Explanatory Note"² to the Risk Analysis, as a basis for USDA's proposed regulatory action³ (the "Proposed Rule").

In brief, since the discovery of a cow with bovine spongiform encephalopathy ("BSE") in Canada in May 2003, USDA has prohibited importation of ruminants and most ruminant meat products from Canada. Under the Proposed Rule, USDA proposes to allow the importation of certain ruminants and ruminant products from Canada, creating a new regulatory category of "BSE minimal-risk regions," and designating Canada as such a region.

As discussed in detail below, the Risk Analysis does not provide a thorough, data-driven assessment of the risks posed by importing live ruminants and ruminant products under the Proposed Rule. Nor does it contain key pieces of a standard risk analysis, including key conclusions, that are needed to guide well-informed risk management decision-making. For example, the Risk Analysis incorporates little or no actual data or explicit, objective calculations from published data. Accordingly, the conclusions reached are expressed in vague, subjective terms. Such an analysis is simply not adequate to inform (or support) a fact-based decision on whether to take an action that could have a significant impact on animal or human health. At best, the Risk Analysis provides an interesting overview of some of the general risk issues involved in importing animals and meats with BSE, and the safeguards in the Proposed Rule intended to reduce those risks. To fully understand the risks, a more thorough, detailed, and methodologically valid risk analysis is essential.

¹ Risk Analysis: BSE Risk from Importation of Designated Ruminants and Ruminant Products from Canada into the United States, USDA, APHIS, October 2003.

² Explanatory Note. Risk Analysis: BSE Risk from Importation of Designated Ruminants and Ruminant Products from Canada into the United States, USDA, APHIS, February 2004.

³ 69 FR 62386 (November 4, 2003).

COMMENTS

1. The USDA has not presented an appropriate risk assessment that supports its proposed action. Its Risk Analysis presents opinions, judgments, and conjectures rather than relevant data and results of transparent and sound quantitative analysis.

Although the USDA has named its supporting document a “risk analysis,”⁴ this document does not (a) conform to standard definitions and concepts for risk assessments or (b) provide the essential information required to inform rational risk management decision-making on this critical issue. It does not provide high-quality risk analysis information suitable for supporting the proposal to import certain live ruminants and ruminant products from Canada. Among others, it does not answer these two key questions:

- (a) *What is the probable change in human health risk (i.e., frequency and severity of adverse human health effects) that would be caused by each alternative risk management option considered (e.g., reopening the US to less restricted imports of Canadian ruminants vs. imposing different types of restrictions vs. keeping the status quo); and*
- (b) *How certain is the change in human health risk that would be caused by each proposed risk management action?*

These questions, and the analogous questions for animal health, are usually considered to be essential components of a health risk assessment. For example, a Joint FAO/WHO Expert Consultation defines risk characterization (corresponding approximately to what USDA terms “Risk Estimation”) as the “integration of hazard identification, hazard characterization [i.e., dose-response or exposure-response relation] and exposure assessment into an estimation of the **adverse effects likely to occur in a given**

⁴ Risk Analysis: BSE Risk from Importation of Designated Ruminants and Ruminant Products from Canada into the United States, USDA, APHIS, October 2003.

population, including attendant uncertainties.”⁵ The U.S. Food and Drug Administration (FDA) has also used this definition⁶ and it is widely shared in the food safety and risk analysis community. Further, the Codex Alimentarius Commission, uses a similar definition: **“The qualitative and/or quantitative estimation, including attendant uncertainties, of the probability of occurrence and severity of known or potential adverse health effects in a given population based on hazard identification, hazard characterization and exposure assessment.”**⁷ Characterizing the risks for different risk management interventions is thus traditionally expected to provide information about likely animal and/or human health effects (frequencies and severities of adverse consequences) for each, thus providing a basis for well-informed decision-making. The USDA Risk Analysis does not provide *any* quantitative or substantive qualitative estimation of the frequency and severity of adverse health effects from the different decision alternatives (beyond undefined adjectives such as “low”, offered without any clear, explicit interpretation or any explicit, verifiable derivation from data).

The crucial “Risk Estimation” section of the USDA Risk Analysis occupies less than half of a page.⁸ It does not present *any* (qualitative or quantitative) information about the likely frequency or severity of adverse human or animal health effects for different risk management interventions (i.e., the usual components of a health risk assessment), but instead opines: “that the animals and animal products under consideration in this analysis are of low or minimal risk in view of the certification requirements that will be implemented.” *But no definition of “Low or minimal risk” is given, so it is impossible to know how to interpret this result.*

“Low or minimal risk” can mean any number of things, such as:

- The smallest we can think of (i.e., zero)

⁵ <http://www.fao.org/docrep/w8901e/w8901e06.htm> (emphasis added).

⁶ <http://www.foodsafety.gov/~dms/lmriskgl.html>. USDA FSIS also repeats the definition in footnote 5.

⁷ <http://www.fao.org/DOCREP/005/Y2200E/y2200e07.htm> (emphasis added).

⁸ Risk Analysis at page 35.

- The smallest risk found among a subset of countries that we want to trade with
- The smallest we can reasonably expect to achieve without spending a lot more money
- The probability of infecting more than 10 people per year is less than 10%
- The probability that Canadian imports, taken in conjunction with current and expected future US conditions, will initiate a widespread epidemic is less than 1%
- The risks are acceptably small, as judged by criteria such as no more than 1 excess fatality per million lifetimes with confidence of at least 95%

“Low or minimal risk” might mean any of these things, or none of them, or perhaps something else entirely. It is too vague to be clearly understandable and useful for purposes of rational risk assessment.” Without a specific definition of what the terms used in its conclusion mean, USDA’s conclusion is, at best, not much more informative or useful than a vague reassurance, along the lines of: “We think it’s very probably ok,” without any independently verifiable justification or derivation from data being presented. This is inadequate as the final output of a “risk analysis.”

The Risk Estimation section of USDA’s Risk Analysis concludes: “In summary, VS considers the risk of BSE-imported animals or animal products entering the United States from Canada and exposing U.S. livestock through feeding of infected materials to susceptible animals, to be low.”⁹ This appears to be no more than an opinion (or, perhaps a risk management policy judgment, if “low” is defined as “acceptable to import”) that is not supported by or explicitly derived from stated facts and data using clear definitions and subsequent analysis via openly published formulas. It does not appear to be based on any documented calculations that integrate factual outputs from the hazard identification (or release), exposure assessment, and consequence steps, as risk assessment traditionally requires. In short, it is not clear that this conclusion actually follows from available facts and data in any transparent, verifiable way, or that it is based on substantive risk analysis as opposed to policy judgments, opinion, or hope.

⁹ Risk Analysis at page 35.

In summary, it is not clear what USDA's "Risk Estimation" conclusions mean in terms of human or animal health impacts, or how they are derived from or supported by factual evidence and objective data. The resulting qualitative reassurances do not constitute an adequate "Risk Analysis", as the essential components of what is usually meant by risk analysis are missing.

2. The USDA has misrepresented and misused the "Harvard Study" in support of its proposed action.

The "Risk Estimation" section of the Risk Analysis¹⁰ states that its conclusions "are consistent with the 2001 Harvard study, which found that the measures taken by the US government and industry make the United States robust against the spread of BSE, should it be introduced into the country." This overstates what the Harvard Center for Risk Analysis (HCRA) model (the "Harvard Study")¹¹ actually found. While that study indicated that its *base case assumptions* implied a high degree of robustness against the spread of BSE, it also clearly indicated that there is enough uncertainty about the validity of these assumptions so that no single, unambiguous set of conclusions can be drawn with very high confidence. The Harvard Study took care to document the sensitivities and crucial assumptions, including unvalidated ones, in its analysis. It explicitly stated that "a true validation of the simulation model described in this report is not possible." It described its base case results as probably being reasonable and plausible, but did not claim that they are correct, or assert that they are suitable for use in this rulemaking or applicable to the definition and characterization of Canada as a minimal-risk region.

The original Harvard Study was prepared in 2001 for a totally different purpose than to serve as analytic support for the importation of live ruminants and ruminant products from Canada. It was also prepared prior to the recent identification of the Canadian and

¹⁰Risk Analysis at page 35.

¹¹ Evaluation of the Potential for Bovine Spongiform Encephalopathy in the United States, Joshua T. Cohen, et. al., Harvard Center for Risk Analysis, November 26 2001, Revised October 2003.

US BSE cases in 2003. Even though the authors of the Harvard Study have recently updated their analysis, none of the simulation runs or analyses was specifically appropriate for the action that the USDA now proposes. None claimed to model the current situation in Canada. USDA does not explain how the Harvard Study, which did not use Canadian data, can even be used as an analytic tool to support reclassifying Canada's risk status. At best, the Harvard Study should be viewed as a first-cut "screening" risk analysis, whose conclusions suggest the need for additional refined risk analyses.

Moreover, as stated in the HCRA report: "Because the feed and MBM parameters include the three parameters that had the greatest univariate impact on the number of additional infected cattle (see Figure 4-1), it is not surprising that assigning worst case values to all the parameters in this set has a substantially greater impact on the number of additional infected cattle. **Assigning worst case values to all of these parameters simultaneously results in an R_0 value exceeding unity at the 75th percentile.** ... We did not simulate the scenario in which all parameters are simultaneously assigned their worst-case values for three reasons. First, the results described in the preceding paragraph indicate that **assigning worst case values to two of the three sets of parameters (demographic assumptions and MBM production, feed production, and feed practice parameters) is sufficient to change the predicted behavior of the agricultural system.**"¹²

The practical implications of this technical passage are as follows. " R_0 value exceeding unity" is the condition for a single new BSE case to be able to start an epidemic, i.e., it is the *opposite* of the base-case, in which a single new BSE case is expected to cause less than one additional new case, and thus imported cases eventually die out. (This reversal of qualitative conclusions from Imported BSE cases will probably die out to Imported BSE cases will probably start an epidemic is what is meant by "sufficient to change the predicted behavior of the agricultural system.") Thus, assigning even a subset of

¹² Harvard Study, line 3465 (emphasis added).

parameters non-baseline values that are within the range that the HCRA team judged as being possible, reverses the reassuring baseline conclusion cited by USDA in the Risk Analysis, instead leading to the conclusion that the US could be sensitive to, rather than robust against, imports of BSE. We believe that this should be of paramount interest to decision makers.

The HCRA report further explains that: “The base case assumes that 94.9999% of cattle remains are sent to prohibited rendering plants, 5% are sent to mixed plants, and 0.0001% are sent (incorrectly) to non-prohibited plants.”¹³ But it later notes that, due to lack of direct, real-world experience with importing BSE-infected cattle, **“a true validation of the simulation model described in this report is not possible.”**¹⁴ Moreover, the HCRA report finds that: “The sensitivity analysis results indicate that the predicted number of additional cattle infected is particularly sensitive to the assumed proportion of prohibited MBM that is mislabeled and the assumed proportion of properly labeled prohibited feed that is incorrectly fed to cattle (i.e., the assumed error rate of only 0.0001% above.) **Predicted human exposure is likewise sensitive to these parameters.** It is also sensitive to the assumed number of ID50s in the carcass of an animal with full blown BSE, and to a lesser extent to several parameters related to the slaughter process.”¹⁵ Being “sensitive” to these assumptions, in this case, means that if error rates are higher than those assumed, BSE-infected cattle imports will have a greater potential to start a US epidemic or to have severe adverse consequences than the base case estimates. In short, the Harvard Study shows that if reassuring base case assumptions are made, reassuring results are produced; while if pessimistic assumptions are made, potentially severe consequences are produced. Which set of assumptions is correct is not known, but both are considered possible. USDA’s paraphrase does not emphasize that the Harvard Study can be used to predict catastrophic as well as reassuring US consequences of BSE imports based on parameter values considered to be possible, and perhaps not extremely unlikely.

¹³ Harvard Study, line 2420.

¹⁴ Harvard Study, line 3125 (emphasis added).

¹⁵ Harvard Study, line 3306 (emphasis added).

The USDA Risk Analysis systematically misinterprets the Harvard Study as being more definitive and reassuring than it really is, e.g., by stating that “The Harvard study found that even if BSE were to enter the United States, it would be unlikely to spread.”¹⁶ That is not a correct summary of what the Harvard Study found. A more accurate summary would be:

The Harvard study found that, even if BSE were to enter the United States, it would be unlikely to spread *under the base case assumptions*, but would be *almost certain to spread* under the “worst-case assumptions”, which are well within the range of possible parameter values. The worst-case assumptions are not known to be incorrect. Their probability or frequency of holding has not been quantified, although they are subjectively judged to be much less plausible than the base case assumptions.

This more accurate summary is considerably less reassuring than USDA’s blanket assurance that BSE “would be unlikely to spread.” The truth is that *the probability that BSE would spread following an introduction has not been quantified*, since the probabilities of “worst-case” assumptions sufficient to cause spread (over at least some area) have not been assessed in either the USDA Risk Analysis or the Harvard Study. This directly refutes USDA’s claim in the Risk Analysis that: “In summary, the scenarios presented in the Harvard study (Harvard Center for Risk Analysis 2001) assess the likelihood of BSE spread upon the unlikely event that it was introduced into the United States.”¹⁷ They do *not* assess the absolute likelihood of BSE spread, but only show that it is highly unlikely under some (base case) assumptions, and almost certain under other (what they call worst-case) assumptions. That setting even a subset of key drivers to values within their allowed uncertainty ranges makes spread highly likely suggests the need for a much more thorough risk analysis, rather than a summary conclusion that, in effect, risk is *de minimis*. Thus, the findings of the Harvard Study should have driven the USDA to commission additional, refined data gathering, development of more refined models (see discussion later), and consequent refined risk analysis. None of this appears to have been done in assessing the risks of the Proposed Action.

¹⁶ Risk Analysis at page 33.

¹⁷ Risk Analysis at page 32.

The need for more refined quantitative risk assessment to support sound risk management decisions is further increased by the fact that the Harvard Study, despite the very useful and well-documented start that it makes on the problem, does not thoroughly model spatial (or other) heterogeneity of BSE risks. If some herds are particularly susceptible, or if other rare conjunctions of unfavorable conditions and parameter values occur in a small fraction (e.g., in less than 1% of cases) of a large number of replicates (e.g., farms, processing runs, etc.) each year in the US, then by chance, combinations of worst-case conditions may occur several times per year at random locations, leading to sporadic adverse animal and human health effects, keeping all other parameters at levels in the Harvard Study.

Indeed, something similar has already been noted by the Harvard Study authors: “Before proceeding, we note that **many of the simulation results are “right skewed,”** meaning that the average value often exceeds the median (50th) percentile and can sometimes even exceed the 95th percentile.”¹⁸ Further, from an import of 10 BSE-infected cattle: “On average, there are fewer than five new cases of BSE, with a 75% chance that there will be no more than one new case, and at least a 50% chance that there will be no new cases at all. **The extreme case (the 95th percentile of the distribution) predicts 16 new cases.**”¹⁹ In other words, the *average case* is reassuring, but the *extreme (yet not impossible) cases* are not. It is the extreme cases that need to be better quantified (i.e., what are their likely frequencies and magnitudes with and without the proposed agency action – i.e., changes in Canadian imports) in order to provide a useful risk assessment for informing decisions about the animal and human health risks in the US of the proposed action – i.e., removing restrictions on Canadian cattle and beef imports.

Adding more thorough analysis of realistic heterogeneities to the HCRA model (e.g., by allowing different animals of the same age to have different susceptibilities) could further increase the importance of considering extreme cases – bearing in mind that, in a large population with enough import events each year, even relatively rare or extreme cases

¹⁸ Harvard Study, line 3340 (emphasis added).

¹⁹ Harvard Study, line 3366 (emphasis added).

will in fact occur a certain proportion of the time. **Such analysis of low-frequency, potentially high health consequence events from removing current restrictions on Canadian beef imports appears to have been omitted entirely from any of USDA's "risk analyses" including the Harvard Study.** For example, there is no tabulation or report comparing the expected frequencies and severities of such events with and without the proposed change in the status of Canadian imports. Yet, quantifying, bounding, or characterizing such rare but undesirable events as a function of the decisions made is an essential part of risk analysis that is needed to inform rational decision-making. This is particularly essential in the present case when the likely adverse publicity from these rare, undesirable events could overwhelm media and public perceptions of the underlying risk.

In summary, it is not concern about the *average case* or *base case* alone that should inform the risk analysis component of decision-making in this case. Rather, it is concern about the less likely (low-frequency) but high-consequence events and the upper tail of the risk distribution that should be the focus of substantive analysis and concern about potential risk. These appear to have been neglected in USDA's Risk Analysis (and is not fully addressed even in the Harvard Study, which indicates the possibility of such right-tail events, but does not address them specifically for the Canadian situation, which was not the focus of that study).

Until some credible information is provided on *how frequently* adverse events are expected to occur with and without the proposed changes in current restrictions on Canadian imports, it is impossible to make an informed judgment about whether the economic benefits outweigh the human and animal health risks. USDA's Risk Analysis fails to perform this crucial function of a risk analysis, leaving its risk management recommendations inadequately supported by risk assessment information.

3. USDA's recent reanalysis is not adequately sensitive to data and does not attempt to address data uncertainties; therefore its conclusions are unsupportable.

In the Proposed Rule, USDA stated:

The analysis of risk we conducted addressed the issue of the prevalence of BSE in Canada. The risk analysis presented evidence that the prevalence was very low and that Canada had strong BSE controls in place. Although the detection of an imported BSE infected cow in Washington State means an additional animal of Canadian origin has been diagnosed with BSE since completion of the risk analysis and publication of the proposed rule, the total number of diagnosed cases attributed to that country remains low. ...Given the conditions APHIS is proposing for the importation of ruminants and ruminant products from Canada, we believe it is highly unlikely that BSE would be introduced from Canada under the proposed rule. Based on the factors discussed in the original risk analysis, along with risk mitigation measures currently in place and those that would be added by the proposed rule, we have concluded that a BSE case in a second cow of Canadian origin does not alter our risk estimate.²⁰

This conclusion and the supporting reasoning violate principles of sound statistical inference and risk assessment, which teach that observing a second adverse event in a monitored population in a comparatively short amount of time after the first observation is informative and should significantly inform (i.e., “update”) data-driven risk estimates, especially when there is high prior uncertainty about model parameters.

The Codex Alimentarius²¹ and many other sources specify that a risk assessment should include an uncertainty analysis. No formal uncertainty analysis section is included in the USDA Risk Analysis, which is therefore incomplete in this respect. Yet, major uncertainties abound that can importantly impact effective risk-management decision-making. Major technical questions and uncertainties that should be addressed and modeled in any thorough analysis of BSE import risks (many of which have indeed been addressed in the relevant quantitative risk literature on BSE risks, especially in the UK) include:

- the roles of horizontal and vertical transmission (if any)
- susceptibility distribution within cattle of the same age
- variability on virulence of different new BSE cases

²⁰ 69 Fed. Reg. 10635-10636 (Nov. 4, 2003).

²¹ <http://www.fao.org/DOCREP/005/Y2200E/y2200e07.htm>

- proportion of infected animals in Canada (“low”, we are told – but *how* low, on what basis?, and with what confidence?)
- detection probability per case (and hence the number of true cases per observed case)
- the age distribution at first infection
- the latency period (and its distribution) until expression
- the potential for clustering of rare events within geographic areas, processing plants, affected populations, etc.
- the status and extent of current and future compliance and attendant consequences of non-compliance (such as mislabeling, etc.) in Canada and the US
- possible heterogeneity of R_0 in different geographic areas or for different strains of BSE, different types of cattle, etc.

These and other sources of uncertainty combine to imply that *a priori* perceptions about risk are sufficiently uncertain so that data on the number of actually detected cases of BSE should be informative in shaping updated beliefs. When the observed rate increases from 1 detected case in the entire past to 2 detected cases within the past year, estimated risks should increase correspondingly. (In Bayesian terms, the prior should be sufficiently diffuse or non-informative, given the above uncertainties, so that the posterior is heavily driven by the data, rather than by the prior. The risk estimate should respond to such data.) This point is discussed further below from the standpoint of parameter estimation.

4. The USDA Risk Analysis makes several important assertions and statements that are not supported by the analysis and data presented.

(a) Although USDA states that: “The analysis of risk we conducted addressed the issue of the prevalence of BSE in Canada...,” no such analysis has been described.

No quantitative estimate of BSE prevalence in Canada has been discussed or presented. USDA's Risk Analysis only discusses the prevalence of BSE by referring to it in vague

subjective terms such as “very low” and “unlikely” to generate cases in the US. Recent history now suggests that fuller information would have given a numerical value of 100% as the probability of this judged “unlikely” event. At a minimum, with the recent detections of BSE in the Canadian herd and in the US, there needs to be better (i.e., supported by objective data) and more quantitative information about the likely prevalence of true (not just detected or qualitatively perceived) BSE infections in Canadian ruminants and ruminant products that would be imported into the US under the Proposed Rule. How likely is it that the BSE prevalence in Canada could be 0.01%, or 0.1%, or 1%, given current and past testing? This would seem to be important information that USDA should supply to support its proposed action. It is not contained in the current risk analysis document, although we believe that available data can help to provide useful upper bounds on how large the prevalence could be, consistent with observations to date.

The qualitative discussion that USDA provides is not adequate from a decision-analytic or rational risk management standpoint. “Very low” is not a useful characterization for informing rational decisions if there is an unacceptably high probability (e.g., 1%) that even a “very low” prevalence could spark major adverse consequences. USDA repeatedly indicates that they expect the consequences of importing BSE cases would most likely be minor, based in part on their reassuring but flawed interpretation of the Harvard Study, as discussed earlier. While this may be plausible, emphasizing *expected* values and *most likely* scenarios does not adequately address risk. For example, is there a 1% (or a 10%) chance that, despite our best current expectations, BSE imports from Canada could spark a catastrophic consequence in the US? If so, even though these probabilities might fit the description of being “very low” or “low,” we believe that they would be unacceptable to most stakeholders.

In summary, a risk analysis that ignores or dismisses the unlikely (but not necessarily any less likely than AIDS or SARS events would once have been judged) possibility of a large downside potential without bounding or quantifying it in any way is simply not

adequate for guiding well-informed risk management decisions focused on protecting public health from unlikely but potentially catastrophic events.

(b) Although USDA states that: "...The risk analysis presented evidence that the prevalence was very low and that Canada had strong BSE controls in place...." no such evidence was presented.

The Risk Analysis presented no quantitative evidence on the true prevalence of BSE in Canada. That Canada has strong BSE controls in place shows, at best, good intentions, but this is not the same as an acceptably low prevalence. Compliance rates were not quantified in the USDA Risk Analysis. The actual prevalence rate in Canada now and under the Proposed Rules have *not* been modeled or estimated in any substantive, responsible way in USDA's Risk Analysis or its later "explanatory note".

(c) Similarly, while the USDA asserts that: "Although the detection of an imported BSE infected cow in Washington State means an additional animal of Canadian origin has been diagnosed with BSE since completion of the risk analysis and publication of the proposed rule, the total number of diagnosed cases attributed to that country remains low....", this is irrelevant and misleading.

What matters for risk assessment purposes is the *occurrence rate* per unit time, not the total (cumulative) *number* ever diagnosed. Two diagnosed cases in less than 1 year is not self-evidently a "low" rate.

(d) Additionally, while the USDA states that: "Given the conditions APHIS is proposing for the importation of ruminants and ruminant products from Canada, we believe it is highly unlikely that BSE would be introduced from Canada under the proposed rule....," this belief is not presented as the result of any rational analysis based on independently verifiable, explicit calculations from data.

In fact, applying the methods of the Harvard Study, which does present independently verifiable calculations from stated assumptions and data, suggests that some BSE imports would be expected from Canada even under the Proposed Rule, if the age distribution of BSE in beef and the probability of erroneous labeling or routing put at least some positive probability, even if it is only 0.0001% per animal, on such an import.

(e) The USDA states that: "Based on the factors discussed in the original risk analysis, along with risk mitigation measures currently in place and those that would be added by the proposed rule, we have concluded that a BSE case in a second cow of Canadian origin does not alter our risk estimate." This violates both common sense and correct statistical analysis.

Statistically, the maximum likelihood estimate for the average number of diagnosed cases per month, given that k such cases have been seen in t months (and assuming a Poisson process for these rare events) is, not surprisingly, k/t expected cases per month. The Bayesian posterior mean (with a gamma conjugate prior) for the expected number of detected cases per month is then $(k + 1)/t$. For both estimators, the difference between the estimate with $k = 2$ and $k = 1$ is substantial. For USDA to assert that its risk estimate remains unaltered by a second occurrence within less than a year suggests that it is not forming its estimates of risk based on data – based either on correct classical (e.g., maximum likelihood estimation) or Bayesian statistical inference. Logically, an empirically based risk estimate *must* be revised upward when the data for estimating infectious case import rates increases from 1 in the entire past to 2 in the past year. If USDA finds that the new data do not cause them to revise upward their previous risk assessment, this must be taken as indicating that either their risk characterization is too crude to be appropriately sensitive to informative data, or else that their risk estimates are not being formed correctly from data (or that they are using some very non-standard model of risk, that then needs to be disclosed and reviewed). As mentioned previously, it is not self-evident to us that 2 cases detected in less than 1 year corresponds to a "low" underlying prevalence in any useful sense.

(f) “Although the BSE-infected cow identified in Washington State was more than 30 months of age when it was diagnosed, it was obviously not imported under the conditions of the yet-to-be-implemented proposed rule, and would not have been allowed to be imported under the proposed rule.”

USDA has not shown that it is not possible (or even that it is extremely unlikely) that at least some imported cattle less than 30 months of age have BSE, or that at least some cattle greater than 30 months of age might inadvertently be imported. To protect animal and human health in the US, realistic estimates for these probabilities and for the resulting rates of BSE imports must be provided. It is not realistic or useful to act as if these rates will be zero (i.e., as if “zero risk” is practical and achievable). What is needed is a realistic estimate of what the risk would be under the Proposed Rule and other alternatives such as the *status quo*.

5. USDA should conduct a proper risk analysis that would directly inform the proposed action. Such a risk assessment should use the best available science, data, and models, should be presented with a high degree of transparency, and should include a thorough discussion of uncertainties, such that a rational decision maker can fully assess not only the result of an expected or most likely event but, more importantly, the result of some less likely but high impact event(s) as well.

Specifically, such a risk assessment should address the following questions in addition to those raised in Comment 3 above:

EXPOSURE

1. What is the probable prevalence of BSE in Canada now and in future under proposed conditions? The modeling should explicitly document the data and assumptions used to answer it, specifically including compliance rates with any existing or future management strategies such as feed bans.

2. What is (and has been) the likely age distribution of BSE infections among Canadian ruminants over time? A variety of models from the UK and Japan address the issue of "hidden" (unobserved) prevalence and the age distribution of unobserved cases.

EXPOSURE-RESPONSE

3. What is the probability distribution for R_0 ?

4. What is the frequency distribution of R_0 in different herds/locations/populations in the US where Canadian ruminants might be imported?

RISK CHARACTERIZATION

5. How much would the probability of a US epidemic in the next 10 years increase if Canadian ruminants are imported under the proposed conditions? (This is driven by the probability that $R_0 > 1$ and the expected time until the first BSE import starts an epidemic.)

6. If $R_0 < 1$, then how would the equilibrium epidemic level of sporadic outbreaks or cases in the US increase if Canadian ruminants are imported? What is the total harm per outbreak? Putting these two together, what is the increment (mean and variance) in flow of harm per unit time from allowing the imports?

CONCLUSION

In summary, the information provided by the Risk Analysis does not provide a reasonable basis from which to make an informed decision on whether to reinitiate trade in ruminants and ruminant products with Canada. For at least the reasons discussed above, it does not provide a technically complete or sound risk analysis, as the term is usually understood. It does not provide the essential technical information needed to inform risk management decision makers about potential risks. This includes information about

exposures, currently estimated true prevalence rates of BSE in Canada, frequencies of compliance and error rates, potential for unusually large or severe adverse consequences of BSE cases under some conditions, and remaining uncertainties. In the absence of currently available risk assessment information on these factors, a decision based on the current USDA Risk Analysis will not be informed by an understanding of the relevant risks to US populations.

Respectfully Submitted,

Louis Anthony Cox, Jr., Ph.D.

Tony Cox, Biographical Sketch

Tony Cox is President of Cox Associates (www.cox-associates.com), an independent Denver-based applied research company specializing in health risk analysis and operations research modeling. Cox Associates' mathematicians and scientists develop and apply computer simulation and optimization models, statistical and epidemiological risk analyses, artificial intelligence data mining technologies, and operations research decision models to improve health risk analysis and decision-making for public and private sector clients.

Dr. Cox holds a Ph.D. in Risk Analysis (1986) and an S.M. in Operations Research (1985), both from M.I.T.'s Department of Electrical Engineering and Computer Science. He has an AB from Harvard University (mathematical economics) and is a graduate of the Stanford Executive Program (1993). He is currently Honorary Full Professor of Mathematics at the University of Colorado at Denver, where he lectures on topics in computational statistics, biomathematics, artificial intelligence, and quantitative health risk assessment. Dr. Cox is also on the Faculty of the Center for Computational Mathematics at the University of Colorado at Denver (<http://www-math.cudenver.edu/ccm/list.html>). He is currently Clinical Professor of Preventive Medicine and Biometrics at the University of Colorado Health Sciences Center, where he pursues research on uncertainty analysis of epidemiological studies and mathematical models of disease causation.

Dr. Cox is on the Editorial Board of *Risk Analysis: An International Journal*, and is a founder and Area Editor of the *Journal of Heuristics*. He is a Fellow of the Society for Risk Analysis (SRA), a full member of the American Statistical Association, and a recipient of the Operations Research Society of America's prestigious ORSA prize (1994) for the best real-world applications of operations research.

Dr. Cox has taught many courses and authored or co-authored over 100 journal articles and book chapters on advanced aspects of risk analysis, operations research, artificial intelligence, and applied statistics. He has over a dozen U.S. patents on applications of statistics and operations research methods in telecommunications and signal processing. His current research interests center on computational statistical methods for causal inference and modeling problems arising in data mining and health and safety risk analysis. Most recently, he has been developing simulation models and new risk analyses of antimicrobial drug resistance. He has worked on these topics for both the FDA and industry in an effort to improve the statistical and risk modeling basis for effective risk management decision-making

LOUIS ANTHONY COX, JR., PH.D

Cox Associates, 503 Franklin Street, Denver, Colorado, 80218
(303)-388-1778 (Phone); (303)-388-0609 (Fax); tony@cox-associates.com

WORK HISTORY

- 1986 - Present President/CEO, Cox Associates. Cox Associates is an independent Denver-based consulting company specializing in health, safety, and environmental risk analysis, applied statistical decision analysis, and operations research modeling for public- and private-sector clients. Cox Associates develops and applies quantitative causal risk analysis models, decision analysis and optimization software, and advanced artificial intelligence and computational statistical techniques for modeling risks and uncertainties to measurably improve client decision-making. Since 1986, Cox Associates has created health risk models for many chemicals and chemical carcinogens. Since 1996, the company and its Chicago-based subsidiary NetAdvantage Inc. (www.netadvantageinc.com) have also provided quantitative modeling and planning software solutions to telecommunications business and engineering decision problems.
- 1987 - 1996 Senior Director/General Manager, USWest Advanced Technologies (USWAT), Boulder, Colorado. Headed Business and Engineering Modeling, Communications Services Research, and Network Architecture divisions; managed twelve director areas and over 100 professional engineers and scientists in the areas of optoelectronics, broadband network architectures and technologies, management science and statistics modeling, network economics and performance analysis, wireless architecture and engineering, network evolution, product test and development, standards, international projects, digital signal processing, network optimization, and breakthrough projects.
- 1980 - 1986 Manager, Applied Decision Sciences practice area; Senior Consultant in Operations Research, Arthur D. Little, Inc., Cambridge, MA
- 1978 - 1979 Senior Research Associate, American Institutes for Research in the Social and Behavioral Sciences (AIR), Washington, D.C. and Cambridge, MA

Current Academic Affiliations

- Clinical Professor, Preventive Medicine and Biometrics, U. Colorado Health Sciences Center
- Honorary Full Professor of Mathematics, University of Colorado at Denver (UCD)
- Faculty, Center for Computational Biology, UCD (<http://www.cudenver.edu/ccb/associates.html>)
- Adjunct Faculty member, Center for Computational Mathematics, UCD
- Instructor, Computer Science Department, University of Colorado at Denver
- Advisory Board, Center for Human Performance and Risk Analysis, University of Wisconsin

Past Academic Affiliations

- Faculty, Daniels School of Business, Denver University, 1987, 1997
- Faculty, School of Business, University of Colorado at Boulder, 1993
- Faculty, Harvard University Extension School, 1986

EDUCATION

- 1986 - Present Professional courses and seminars in biomathematics, molecular and cell biology and toxicology, epidemiology, applied statistics, operations research, digital signal processing, image processing, and mathematical optimization.
- 1993 Stanford Executive Program, Stanford Business School
- 1985 - 1986 M.I.T., Ph.D. in Risk Analysis. Dissertation: "Mathematical Foundations of Risk Measurement"
- 1983 - 1985 M.I.T., S.M. in Operations Research, Department of Electrical Engineering and Computer Science
- 1979 - 1983 Harvard University, graduate courses in applied mathematics, theoretical and applied statistics, psychometrics, and decision sciences
- 1975-1978 Harvard University, A.B. (Mathematical Economics)

ACADEMIC EXPERIENCE

Professional Courses Taught:

- *Probabilistic risk analysis: Assessment, management, and communication.* Harvard Center for Risk Analysis. Boston, MA. September 5th-7th, 2000-2003. Lectures on Developing Valid Probability Models from Data, Subjectivity in Data Analysis, and Examples and Applications (2000); Bayesian inference in multivariate data sets and causal modeling (2001). <http://www.pracourse.harvard.edu/schedule.html>
- *Probabilistic risk analysis.* Professional course for Health Canada. Ottawa, Ontario. March 25th-28th, 2002. Lectured on "Using epidemiological data in risk assessment" and on "Causal graphs, Bayesian belief networks, and influence diagrams: A framework for risk assessment and risk management".
- *Advanced Methods for Dose-Response Assessment: Bayesian Approaches.* Resources for the Future Conference Center, Washington, D.C. September 18th-20th, 2000 http://www.rff.org/disc_papers/PDF_files/0115.pdf.
- "Bayesian methods for assessing uncertain exposures", *Workshop on Probabilistic Methods for Risk Assessment.* Society for Risk Analysis, Phoenix, Az, 12-06-98.
- *Advances in Wireless Technology,* Denver University, University College, Fall Semester, 1997
- *Introduction to Decision Analysis for Risk Management,* United States Department of Agriculture's APHIS Introductory Risk Analysis course, University of Maryland Conference Center, July 9, 1992.

- *Risk Assessment Modeling*, one-day short course given at the USDA Training Center, APHIS Risk Assessment Course, Fort Collins, CO, July 23-24, 1992.
- *Technical Risk Communication*, short-course given at the Greenbelt Marriott Hotel, APHIS Advanced Risk Communication Course, Greenbelt, MD, August 20, 1992.
- *Biologically-Based Risk Assessment*. Short course, Society for Risk Analysis, 1991.

Graduate Courses Taught:

- *Causality, Inference, and Decision-Making*, University of Colorado at Denver, 2002-3
<http://isl4.cudenver.edu/Courses/CourseScheduleSpring.asp>
- *Decision and Risk Analysis*, University of Colorado at Boulder, 1993
- *Statistics for Business*, Denver University Graduate School of Business, 1987-88
- *Social Decision and Risk Management*, Harvard University Extension School, 1986

Dissertations Supervised

Since 1990, Dr. Cox has served on S.M. and Ph.D. thesis committees at the University of Denver (S.M. thesis on genetic algorithms) and the University of Colorado (S.M. thesis on innovations in voice messaging, 1995; Ph.D. thesis on classification trees for learning forecasting models from data, 1999; MS thesis on ant colony optimization for bandwidth packing, 2000, MS project on data mining and causal simulation modeling, 2000; Ph.D. thesis on uncertainty analysis in epidemiology, 2003.)

Research Collaborations

At U S WEST Advanced Technologies, Dr. Cox initiated and led collaborative research projects with top researchers at many universities, including

- Harvard University (projects on combinatorial optimization and on interactive mixed natural language and graphics dialogue interfaces, with Professor Barbara Grosz)
- Columbia University (dynamic traffic routing with Professor David Yao)
- Syracuse University (machine comprehension of scientific abstracts)
- Oregon Graduate Institute (breakthroughs in neural net and digital signal processing technologies for automated speech recognition with Professor Ron Cole).

In 1992, his collaboration with mathematicians at the University of Colorado at Denver on combinatorial optimization heuristics for network routing was selected by the Colorado Advanced Software Institute (CASI) as one of only two projects (out of 30) that exemplified this state-funded Institute's major goals: outstanding industry-university technical research with high commercial value. In 1993 and 1994, his collaborations with UCD on new data mining algorithms and pattern recognition techniques for risk analysis and fault diagnosis algorithms were the only projects to receive CASI's award. Dr. Cox currently collaborates with colleagues at Bell Labs and the University of California on fundamental research in multistate reliability and biomathematical modeling.

Recent Conference Sessions Chaired

Dr. Cox has most recently chaired conference sessions on:

- Toxicology. *Non-Linear Dose-Response Relationships in Biology, Toxicology, and Medicine: An International Conference*. (University of Massachusetts, Amherst, MA, May 28-30th, 2003)
- Special Applications in Industry and Government. (Society for Risk Analysis, 2002)
- Market Modeling and Policy (INFORMS Telecommunications Conference, 2002)
- Wireless Network Planning (INFORMS Telecommunications Conference, 2002)
- Optical Networks (8th International Conference on Telecommunications Systems, 2000.)
- Telecommunications (INFORMS, 2000)
- Marketing (INFORMS, 1999)
- Forecasting and Economics (INFORMS Telecommunications Conference, 1998)
- Stochastic Optimization (Society for Industrial and Applied Mathematics, 1996)
- Planning Heuristics for Telecommunications Networks (INFORMS, 1996).

In the past he has chaired INFORMS conference sessions on:

- Risk and Uncertainty
- AI Heuristics for Optimization
- Heuristic Optimization for Process Improvement.

He was Cluster chair for sessions on "Heuristic Optimization and Learning" (1994). He has also chaired sessions on:

- Dose-Response Relationships
- Uncertainty Analysis

and related topics at Society for Risk Analysis (SRA) annual conferences.

Other Academic Experience

From 1987-1992, Dr. Cox served on the Industry Advisory Board of the Mathematics Department at the University of Colorado at Denver, where he is now Honorary Full Professor of Mathematics and on the Faculty of the Center for Computational Mathematics. He has given invited talks on advanced topics in risk analysis, telecommunications engineering and management, and computer science to faculties and graduate seminars at many top universities. He is a frequent reviewer for operations research journals, is on the Editorial Board of *Risk Analysis: An International Journal* and is Area Editor of the *Journal of Heuristics*, which he helped to found in 1995. He has reviewed many academic research proposals for the National Science Foundation's Decision, Risk, and Management Science program and SBIR technology proposals for NSF and other agencies. He lectures frequently on biomathematics and cancer risk modeling at the University of Colorado at Denver. Dr. Cox co-taught a short-course on *Biologically-Based Risk Assessment* at the Society for Risk Analysis Annual Meeting in 1991 and a workshop on *Probabilistic Methods in Risk Assessment* at the Society for Risk Analysis Annual Meeting in 1998.

CONSULTING EXPERIENCE

Examples of applied statistics, epidemiology, operations research, and health risk analysis projects completed by Dr. Cox in the past decade include the following:

HEALTH, SAFETY, AND ENVIRONMENTAL RISK ANALYSIS EXPERIENCE

- For the Animal Health Institute, served on an Expert Panel to review human health risks from animal antibiotics (2002)
- For the U.S. Environmental Protection Agency, served as an external expert reviewer for the EPA's "Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization" Draft External Review Document (March, 2002).
- For the World Health Organization (WHO), served as an external expert reviewer for a Consultation on Campylobacter risk assessment, in Geneva (August, 2001)
- For the U.S. Food and Drug Administration (FDA), (a) Reviewed proposed approaches to modeling human health risks from Ciprofloxacin resistance in Campylobacter jejuni induced by use of Enrofloxacin in chickens (1999) <http://www.fda.gov/cvm/antimicrobial/tonycox/index.htm>; and (b) Developed a proposed decision-analytic alternative to FDA's threshold approach for managing risks of resistant strains of pathogenic bacteria due to use of antibiotics in animals (2001).
- For the U.S. EPA, served as expert external reviewer and contributor to *Review of Uncertainty and Variability Analysis In IRIS for Eight Substances*. http://www.epa.gov/ncea/hlthfx_iris.htm
- Created computer simulation models (PBPK and PD) of dose-time-response relations for low-level exposures to chemical carcinogens, for Exxon Biomedical Sciences (EBSI). Developed an artificial intelligence method for improving prediction of likely human chemical carcinogens, also for EBSI.
- Created a discrete-event stochastic simulation model of the human health risks associated with Ciprofloxacin resistance in Campylobacter jejuni induced by use of Enrofloxacin in chickens, for the Animal Health Institute (AHI). <http://www.cvmb.colostate.edu/cveadss/schedule/SchedulePage.htm>
- Critically reviewed epidemiological studies of diesel exhaust and human lung cancer risk, for the Engine Manufacturers Association.
- For the American Petroleum Institute (API), created a computer simulation model of bone marrow and blood cell toxicity caused by cyclophosphamide, an immunosuppressive drug. Designed laboratory experiments to validate the model's predictions. Analyzed clinical and laboratory data to test model's predictive validity. Prepared a software release so that other scientists could use the model.
- Reviewed literature on air pollution and human lung cancer risks, for the American Petroleum Institute.
- Applied adaptive spatial sampling to optimize search and clean-up efforts for remediating residential properties around an abandoned hazardous waste site (for AlliedSignal)
- Reassessed human cancer risks from 1,3-butadiene using pharmacokinetic modeling to adjust for interspecies differences in internal doses of epoxybutene (for the Chemical Manufacturers Association)
- Reassessed the human leukemia risks from benzene exposure using a physiologically-based pharmacokinetic (PBPK) model to calculate internal dose (for the American Petroleum Association)

Reviewed design of an initiation-promotion experiment for studying the potential carcinogenicity of a rubber additive, for Goodyear Tire and Rubber Company.

Developed a general physiologically-based pharmacokinetic (PBPK) modeling software tool for rapidly developing high-quality PBPK models (with ENSR Consulting and Engineering, Inc.)

Reviewed artificial intelligence approaches to characterizing uncertain health risks using weight of evidence, nonmonotonic, and other uncertainty analysis (for Lawrence Berkeley National Laboratory)

Assessed potential health risks associated with occupational exposure to herbicides among roadside workers, using pharmacokinetic models, for a Fortune 100 chemical manufacturer.

Recommendation of cleanup priorities for a large hazardous waste site in Canada

Developed a prototype computer model for biologically based risk assessment of chemical carcinogen risks, for the Western States Petroleum Association (WSPA) and the American Petroleum Institute (API)

Reviewed new biostatistical and "biologically based" approaches to cancer risk analysis, for the California Department of Health Services

Reviewed regulatory history of benzene risk assessments and of biomathematical approaches to modeling leukemogenesis for the Western Oil and Gas Association and the American Petroleum Institute

Prototype computer modeling of the AIDS epidemic (with Arthur D. Little, Inc.)

Designed a 2-year bioassay experiment for isoprene. Analyzed and reported the resulting experimental data for a multi-client, multinational industry group coordinated by Exxon Biomedical Sciences.

Accident risk analysis and consequence analysis of a petrochemical storage facility in California, for a California-based environmental consulting firm

Implemented a Macintosh version of a physiologically-based pharmacokinetic (PBPK) model for benzene pharmacokinetics and total metabolism in rodents and humans, for the API

Explored new mathematical approaches and conceptual frameworks for dealing with scientific uncertainties in biologically-based risk assessment, for the Western States Petroleum Association (WSPA)

Created an interactive data analysis and graphics package for determining the degree of worker protection provided by different respirators, filters, and face masks (with Arthur D. Little, Inc.)

Microeconomic and applied probability modeling of insurance company business risks for use in tax litigation (with Arthur D. Little, Inc.)

Critically reviewed a transportation risk analysis for liquefied natural gas (LNG) operations in the St. Lawrence seaway.

Reviewed progress since 1985 in using decision analysis for accident risk assessments.

Implemented an experimental "intelligent" data base management system for chemical health effects data bases (with Exxon Biomedical Sciences, Inc.)

Uncertainty analysis of PBPK modeling and risk analyses, accounting for model uncertainties and population heterogeneity, for the American Industrial Health Council.

Developed new techniques to cancer risks associated with mineral oils, for Mobil Oil.

MARKETING DATA MINING AND MODELING EXPERIENCE

- In April, 2002, delivered to an internet services provider (ISP) a decision-support model for predicting customers with the highest churn potential and recommending specific interventions to reduce churn. This system was found by the client to reduce churn by over 40% within 4 months among at-risk customers.
- In March, 2002, delivered to a financial services company a set of predictive clusters for simultaneously predicting churn, upsell, and cross-sell potentials for existing customers.
- In October, 2001, completed a study to identify ways to predict which competitive local exchange carrier (CLEC) customers would experience the most revenue growth in the next quarter and which would be most likely to drop accounts.
- In August, 2001, completed an analysis of insurance customer data showing that combining information from homeowner, auto, and other insurance lines using classification trees and transition models could dramatically improve accurate identification of cross-sell, up-sell, and retention opportunities.
- In December, 2000, completed a study of purchasing patterns among large business customers for Qwest communications. The results show that a few key products, together with factors such as account age, predict likely stability or churn of customers, as well as likely growth potential.
- In 2Q, 2000, delivered to statistical analyses of the effects of U S WEST and competitor advertising and publicity (including brand/service commercials, direct mail, and news stories) on customer ratings of value and loyalty.
- Analyzed marketing data for AT&T-TCI to determine which current cable customers are most likely to switch to digital cable in the next quarter, based on current cable, telephony, and demographic risk factors.
- Created and validated a statistical (semi-Markov state transition) risk model to predict product and account attrition among U S WEST customers. Delivered to the CRMS group in U S WEST Communications a predictive model for identifying the likely future purchasing, product-drop, and account disconnect behaviors of individual customers. The new model has significantly greater predictive power than previous ones, achieving lifts of several hundred percent on the task of predicting which 10% of customers are most likely to buy specific products in the next few months.
- Developed new statistical optimal matching procedures to decide which products to offer which customers to maximize average revenue yield and lifetime revenue value for U S WEST Communications. Demonstrated a potential increase of over 40% for short-term revenues. 15% revenue increase was achieved in a preliminary in-market trial of intelligent scripting.
- Used a new causal modeling and data-mining technique to predict likely future product purchases from past purchase data and demographics, for U S WEST Consumer Services Group.
- Created a new forecasting model for application to short-term and cross-sectional market data. The new method combined classification tree analysis with compartmental flow simulation. Applied to real data, it successfully allowed growth in demand for access lines to be predicted as accurately using less than 6 months of data as was previously possible using over 5 years of data with conventional time series forecasting methods. The forecasts were used by U S WEST Communications in 1997.
- Created and implemented a combined machine-learning/transition simulation forecasting technique to use detailed call records to more accurately predict traffic loads arriving at different locations within a wireless network for PrimeCo Personal Communications Services Ltd.

- Developed a simulation-based model of cable customer transitions among different behaviors (adding and dropping basic and enhanced cable services, switching among services and locations, etc.) for TCI.
- Analyzed cable franchise data for over 400 TCI cable systems to identify predictors of service quality perceptions and churn. Successfully identified unexpected demographic predictors of profitability and satisfaction.
- Analyzed macroeconomic data and survey data for a consortium of Indonesian companies to predict the penetration of telephony, PCs, internet services, and cable over the next 15 years.

TELECOMMUNICATIONS NETWORK DESIGN AND OPTIMIZATION EXPERIENCE

After leaving U S WEST Advanced Technologies, Dr. Cox has led the following projects for Cox Associates and its subsidiary, NetAdvantage, Inc.:

- Developed network planning, optimization, and risk analysis tools for a satellite company (3Q-02)
- Created a competitive cost model for Sprint's national optical network (1Q-3Q, 2002)
- Delivered a Passive Optical Network (PON) configurator tool to a PON equipment vendor (1Q-02)
- Delivered to Sprint a port-level SONET ring planning tool. An initial version of the tool was successfully used in creating Sprint's 2002 network build plan (4Q-01)
- Delivered to Redback Networks of a card-level SONET ring planning and optimization tool (3Q-01). This software tool is now marketed commercially by Redback Networks and NetAdvantage, Inc.
- Delivered to Sprint a dark fiber network configuration planning tool, incorporating a proprietary genetic algorithm, that reduced costs of metro-area networks by over 50% compared to manual solutions. (1Q-01 for fiber-only version, 3Q-01 for version with wireless link options)
- Delivered to Tellium a Dense Wave Division Multiplexing (DWDM) mesh topology design tool, now marketed commercially as StarNet Planner. (4Q-00)
- Delivered to Kestrel Solutions a SONET Ring Planning tool for optimizing placement of optical add-drop multiplexer components in optical ring networks. (3Q-00)
- Created a new design for a backhaul network in Colorado that saved AT&T Wireless over 20% on their monthly backhaul charges. The new design, based on large-scale integer programming optimization, re-assigned traffic to hubs and recommended adding two new hubs to reduce system costs. (1999)
- For Sprint PCS, analyzed market demand forecasts and switching and interconnect costs. Created a 20-period network growth and capacity planning and optimization model. Identified a way to save over \$1M (approximately 10%) of network capital expenses for a small city by reconfiguring the initial choice of switch modules to allow a more efficient capacity expansion growth path (1997).
- For Cox California PCS, created a backhaul network optimization program, solved via a new genetic algorithm, that reduced monthly backhaul costs by over 10% through more efficient of digital circuits to hubs and more economical use of SONET facilities.
- For PrimeCo Personal Communications Services, Ltd., created an optimization model of Multi-Channel Controller Card assignment and inventory management to reduce the costs of expanding network capacity through base station capacity upgrades.

PREVIOUS INDUSTRY EXPERIENCE

Before starting Cox Associates in 1986, Dr. Cox consulted in health and safety risk analysis, operations research, computer science, and econometrics for Arthur D. Little, Inc. He managed a multimillion dollar artificial intelligence risk analysis software development project for the U S Air Force and led cases covering environmental fate and transport modeling of pollutants, risk analyses for transportation and processing facilities, reliability modeling of complex systems, and a variety of product development, insurance, R&D, computer security, and electric utility applications. He also acted as expert statistician and economist in support of several contract, tort, and administrative law cases.

In 1984, Dr. Cox won Arthur D. Little's Presidential Award for outstanding contributions to the development of R&D planning and risk assessment methodologies for the Electric Power Research Institute (EPRI).

Prior to joining Arthur D. Little, Inc., in 1979, Dr. Cox worked in societal risk analysis, experimental cognitive psychology of text processing, and applied statistics at the American Institutes for Research (AIR). He also co-authored a book, featured on *Good Morning America* in 1979 and still widely cited, on the effects of court sanctions on the risks of chronic delinquent behavior.

OTHER TECHNOLOGY EXPERTISE

Dr. Cox was U S WEST Advanced Technologies' expert on artificial intelligence, decision and risk analysis, and digital signal processing technologies, emphasizing pattern recognition, spoken language understanding, and machine-learning applications.

He has appeared on CNN (August, 1991) and has been interviewed by KGNU Radio (October, 1994), the *Wall Street Journal* (May 18, 1992), *Newsweek* (October 6, 1992), and various newspapers (1995, 1996) about profitable business applications of these and related technologies. He frequently represented U S WEST to regulators and utility commissions in explaining the purpose, value, and accomplishments of U S WEST's work these areas.

PROFESSIONAL ACTIVITIES

Professional Societies

- Fellow of the Society for Risk Analysis (SRA). (Fellowship recognizes lifetime contributions to the field of risk analysis)
- Full member of the Institute for Operations Research and the Management Sciences (INFORMS). (Full membership recognized professional and academic achievements in operations research.)
- Member of the American Statistical Association since 1993.

Positions Held

- Secretary and co-founder, New England Chapter of the SRA, 1985-86
- Counselor, Rocky Mountain Chapter of the SRA, 1990-1991
- Elected as one of two Counselors for the 400-member ORSA Special Interest Group on Telecommunications, 1992
- Member of the International Life Sciences Institute's (ILSI's) Risk Science Institute Cancer Dose-Response Working Group in 1991-1992.

Awards and Honors

- Society for Risk Analysis Best Paper Award, 2002, www.sra.org/news0203.pdf
- Full Member of the Institute for Operations Research and Management Science
- Elected to the New York Academy of Sciences, 1992
- Fellow of the Society for Risk Analysis, 1993
- INFORMS Prize, 1994

At U S WEST Dr. Cox also received many awards, including, in 1994, the Operations Research Society of America's prestigious ORSA Prize, awarded annually to the company in the world that has best applied operations research methods in innovative ways that have had profound business impact. In 1991 Dr. Cox won U S WEST's Special Achievement Award for developing new approaches to business risk analysis that are now widely applied by U S WEST International. In 1992, he won the U S WEST's Chairman's Award and two Special Achievement Awards for innovations in network design credited with saving U S WEST over \$100M. In 1994, Dr. Cox won U S WEST's new President's Club and Circle of Excellence Awards for innovations in probabilistic analysis of customer choice behavior.

LOUIS ANTHONY COX, JR. – PATENTS

Dr. Cox has successfully applied risk analysis, statistical decision theory, and optimization principles to several fields in innovative ways. He is inventor or co-inventor of the following innovations.

Speech Synthesis Using Perceptual Linear Prediction Parameters (U.S. Pat. # 5,165,008, awarded November 17, 1992. Canadian Patent #2,074,418 awarded December 12, 1995.)

Method and System for Optimized Logistics Planning (U.S. Pat. # 5,450,317, awarded September 12, 1995, <http://www.patents.ibm.com/details?pn=US05450317>)

Method and System for Designing Least Cost Local Access Networks
(U.S. Patent #5,508,999, awarded April 16, 1996.)

Method and System for Planning and Installing Communication Networks.
(U.S. Patent #5,515,367, awarded May 7, 1996.)

Automated System and Method for Voice Processing.
(U.S. Patent #5655006, awarded August 5, 1997.)

Method and system for identifying a corrupted speech message signal.
(U.S. Patent #5,684,921, awarded November 4, 1997.)

Method for providing a linguistically competent dialogue with a computerized service representative. (U.S. Patent #5,685,000, awarded November 4, 1997.)

Method and system for developing network analysis and modeling with graphical objects.
(U.S. Patent #5,715,432, awarded February 3, 1998)

Adaptive knowledge base of complex information through interactive voice dialogue.
(U.S. Patent # 5,774,860, awarded June 30, 1998)

Method and system for linguistic command processing in a video server environment.
(U.S. Patent #5,832,439, awarded November 3, 1998)

Architecture and method for providing interactive broadband products and services using existing telephone plant. (U.S. Patent #5,857,142, awarded January 4, 1999.)

Method for annotating and editing voice messages via acoustic bullet points. (U.S. Patent #5,943,402, awarded August 24th, 1999, <http://www.patents.ibm.com/details?pn=US05943402>)

Calendar system with direct and telephony networked voice control interface. (U.S. Patent #6,009,398, awarded December 28th, 1999,
http://www.patents.ibm.com/patlist?icnt=US&patent_number=6009398&x=27&y=11)

Method and system for designing a cellular communication system. (U.S. Patent #6,181,917, awarded January 30th, 2001, <http://www.delphion.com/cgi-bin/viewpat.cmd/US06181917>)

LOUIS ANTHONY COX, JR., PH.D.
SELECTED PUBLICATIONS

Books

- Cox, L.A., Jr., *Risk Analysis: Foundations, Models and Methods*. Kluwer, 2001.
- Cox, L.A., and P.F. Ricci (eds), *New Risks: Issues and Management*. Plenum Press, 1990.
- Murray, C.A., and L.A. Cox, Jr., *Beyond Probation: Juvenile Corrections and the Chronic Delinquent*. Sage Publications, Beverly Hills, CA, 1979.

Articles and Chapters

- Cox, L.A., Jr., "Mortality associated with foodborne bacterial gastrointestinal infections reexamined". *British Medical Journal*. Rapid Response. February 19th, 2003.
<http://bmj.com/cgi/eletters/326/7385/357#29767>
- Cox, L.A., and Popken, D.A., 2003. Quantifying human health risks from virginiamycin used in chickens. Forthcoming in *Risk Analysis*.
- Bafundo KW, Cox LA, Jr., Bywater R, 2003. The use of virginiamycin in food animal production. *Feedstuffs*. Jan. 20, 2003. 26-27.
- Lipscomb, J., et al., 2003. The impact of Cytochrome P450 2E1-dependent metabolic variance on a risk relevant pharmacokinetic outcome in humans. *Risk Analysis*. (Forthcoming, accepted 3-03)
- Ricci PF, Rice D, Ziagos J, Cox LA. Precaution, uncertainty and causation in environmental decisions. *Environ Int*. 2003 Apr;29(1):1-19.
- Cox L.A., 2002. Reexamining the causes of campylobacteriosis. *International Journal of Infectious Diseases*. Dec. 6. Supplement 3:S26-S36
- Cox, L.A., and Popken, D.A., 2002. Quantifying human health impacts of antimicrobial risk management alternatives for enrofloxacin. Winner, Society for Risk Analysis Best Paper Award, December, 2002. Under review by *Risk Analysis*. www.sra.org/news0203.pdf
- Cox, L.A., and Popken, D.A., 2002. A simulation model of human health risks from chicken-borne *Campylobacter jejuni*. *Technology*, 9:55-84.
- Cox, L.A. Jr., 2002. Data mining and causal modeling of customer behaviors. *Telecommunications Systems*. 21(2-4):349-381.
<http://www.mgmt.purdue.edu/faculty/kemal/telecomm/boca2000contents.pdf>

Cox, L.A., Jr., and Popken, D.A., 2002. A hybrid system-identification method for forecasting telecommunications product demands. *International Journal of Forecasting* Volume 18, Issue 4, October-December 2002, Pages 647-671

Cox LA, Jr., and Ricci, PF, 2002. Empirical causation and biases in epidemiology: Issues and solutions. *Technology*, 9:23-53.

Byrd DM, Cox, JA, Jr., Wilson, JM, 2001. Tracking antibiotics up the food chain. Letter to the Editor, *Science*, 291, 30 March, 2001, p. 2550.

Cox, L.A., Jr., J.R. Sanchez, and Lu, L., 2001. Cost savings from optimized packing and grooming of optical circuits: Mesh vs. ring comparisons. *Optical Networks Magazine*, May-June, 72-90.

Cox, L.A. Jr., 2001. Forecasting demand for telecommunications products from cross-sectional data. *Telecommunications Systems*, 16:3, 439-456.

Cox, L.A., Jr., 2000. A biomathematical model of cyclophosphamide hematotoxicity. *Journal of Toxicology and Environmental Health, Part A*, 61:5-6, 501-510 (pp. 501-552 with discussions). November, 2000.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11086959&dopt=Abstract

Cox, L.A., Jr., Chiu, W.A., Hassenzahl, D.M., Kammen, D.M., 2000. Low dose responses: Response to Wilson. *Risk Analysis*, 20, 3, June, 2000.

Cox, L.A., Jr., and J.R. Sanchez, 2000. Designing least-cost survivable wireless backhaul networks. *Journal of Heuristics*, 6, 525-540.

Chiu, S.Y., L.A. Cox, Jr., X. Sun, 1999. Optimal sequential inspections of reliability systems subject to parallel-chain precedence constraints. *Discrete Applied Mathematics* Vol. 96-97 (1-3), pp. 327-336.

Cox, L.A., Jr., 1999. A biomathematical model of hematotoxicity. *Environment International*, 25, 6/7, September, 805-817.

Cox, L.A., Jr., 1999. Internal dose, uncertainty analysis, and complexity of risk models. *Environment International*, 25, 6/7, September, 841-852.

Cox, L.A., Jr., 1999. Adaptive spatial sampling of contaminated soil. *Risk Analysis*, 19, 6, 1059-1069.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=10765446&dopt=Abstract

Cox, L.A., Jr., K. Paige, D. Popken, 1999. Software review of Analytica 1.2. *Human and Ecological Risk Assessment*, 5, 2, 305-316.

Lu, L., SY Chiu, and LA Cox, Jr. 1999. Optimal project selection: Stochastic knapsack with finite time horizon". *Journal of the Operational Research Society*, 50, 645-650.

Fraughnaugh, K., J. Ryan, H. Zullo, L.A. Cox, Jr., 1998. Heuristics for efficient classification. *Annals of Operations Research*, 78, 189-200.

Davis, L., L.A. Cox, Jr., W.E. Kuehner, L. Lu, D. Orvosh, 1997. Dynamic hierarchical packing of wireless switches using a seed, repair, and replace genetic algorithm. *Journal of Heuristics*, 3, 3, 187-206.

Cox, L.A., Jr., 1997. Does diesel exhaust cause human lung cancer? *Risk Analysis*, 17, 6, 807-829.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9463933&dopt=Abstract

Cox, L.A., Jr., 1996. Reassessing benzene risks using internal doses and Monte-Carlo uncertainty analysis. *Environmental Health Perspectives*, 104, Supplement 6, 1413-1429.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9118928&dopt=Abstract

Cox, L.A., Jr., 1996. Using causal knowledge to learn more useful decision rules from data. Chapter 2 in D. Fisher and H.-J. Lenz (eds), *Learning from Data: AI and Statistics V*. Springer-Verlag, 1996.

Cox, L.A., Jr., 1996. More accurate estimates of dose-response functions using Monte-Carlo uncertainty analysis: The Data Cube approach." *Human and Ecological Risk Assessment*, 2, 1, 146-170.

Cox, L.A., Jr., and G. Bell, 1996. A machine-learning approach to process improvement in a telecommunications company. *Annals of Operations Research*, 65, 21-34.

Cox, L.A., Jr., M.G. Bird, and L. Griffis, 1996. "Isoprene cancer risk and the time pattern of dose administration." *Toxicology*, 113, 263-272.

<http://www.ncbi.nlm.nih.gov/htbin-post/Entrez/query?uid=8901907&form=6&db=m&Dopt=b>

Cox, L.A., Jr., L. Davis, L. Lu, D. Orvosh, X. Sun, D. Sirovica, 1996. "Reducing costs of backhaul networks for PCS companies using genetic algorithms." *Journal of Heuristics*, 2, 1-16.

Cox, L.A., Jr., S. Chiu, and X. Sun, 1996. "Least-cost failure diagnosis in uncertain reliability systems". *Reliability Engineering and System Safety*, 54, 2-3, 203-316.

Chiu, S., L. Lu, and L.A. Cox, Jr., 1996. "Optimal access control for broadband services: Stochastic knapsack with advance information". *European Journal of Operational Research*, 89, 127-134.

Placke, M.E., L. Griffis, M. Bird, J. Bus, R.L. Persing, L.A. Cox, Jr., 1996. "Chronic inhalation oncogenicity study of isoprene in B6C3F1 mice." *Toxicology*, 110, 253-262.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8901906&dopt=Abstract

Schnatter, A.R., M.G. Bird, L.A. Cox, Jr., and R.F. Herrick, 1996. "Defining optimal exposure assessment methods and metrics for epidemiologic studies exposures of petroleum distribution workers to benzene." *Occupational Hygiene*, 155-160.

Sun, X., Qiu, Y., and Cox, L.A., Jr., 1996. "A hill-climbing approach to construct near-optimal decision trees." in D. Fisher and H.-J. Lenz (eds), *Learning from Data: AI and Statistics V*. Springer-Verlag.

Cox, L.A., Jr., 1995. "Simple relations between administered and internal doses in compartmental flow models," *Risk Analysis*, **15**, 2, 197-204.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=7604169&dopt=Abstract

Cox, L.A., Jr., 1995. "An exact analysis of the multistage model explaining dose-response concavity," *Risk Analysis*, **15**, 3, 359-368.
<http://www.ncbi.nlm.nih.gov/htbin-post/Entrez/query?uid=7604169&form=6&db=m&Dopt=b>

Grover, R.W., and L.A. Cox, Jr., 1995. "Dynamic site portfolio remediation optimization model," *Hazardous Waste Strategies Update*, **6**, 4, 31 - 39.

Cox, L.A., Jr., and Y. Qiu. "Optimal inspection and repair of renewable coherent systems with independent components and constant failure rates," *Naval Research Logistics*, **41**, 771-788, 1994.

Cox, L.A., Jr., and Y. Qiu, "Minimizing the expected costs of classifying patterns by sequential costly inspections," in P. Cheeseman and R.W. Olford (eds), *Selecting Models from Data*. Springer-Verlag, *Lecture Notes in Statistics*, Volume 89, pp. 339-350. New York, 1994.

Cox, L.A., Jr., "Knowledge acquisition for model building," *International Journal of Intelligent Systems*, **8**, 1, 91-104, 1993.

Cox, L.A., Jr., "Combining the probability judgements of experts: Statistical and artificial intelligence approaches", Chapter 26 in D.J. Hand (ed), *Artificial Intelligence Frontiers in Statistics*. Chapman and Hall, 1993.

Cox, L.A., Jr., W. Kuehner, S.H. Parrish, and Y. Qiu, 1993. "Optimal expansion of fiber-optic telecommunications networks in metropolitan areas," *Interfaces*, **23**, 2, 35-48, March-April, 1993.

Davis, L.D., Y. Qiu, L.A. Cox, Jr., and D. Orvosh, "A genetic algorithm for survivable network design", *Proceedings of the 5th International Conference on Genetic Algorithms*. Morgan Kaufmann, 1993.

Qiu, Y., and L.A. Cox, Jr., "Heuristic testing procedures for general coherent systems," *European Journal of Operational Research*, **69**, 65-74, 1993.

Cox, L.A., Jr., "Extending the stochastic two-stage model of carcinogenesis to include self-regulation of the non-malignant cell population," *Risk Analysis*, **12**, 1, 129-138, 1992.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1410709&dopt=Abstract

Cox, L.A., Jr., and P.F. Ricci, "Reassessing benzene cancer risks using internal doses," *Risk Analysis*, **12**, 3, 401-410, 1992.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1410709&dopt=Abstract

Cox, L.A., Jr., and P.F. Ricci, "Dealing with uncertainty: From health risk assessment to environmental decision making," *Journal of Energy Engineering*, **118**, 2, 77-94, 1992.

Cox, L.A., Jr., Y. Qiu, and L. Davis, "Guess-and-verify heuristics for reducing uncertainties in expert classification systems," in D. Dubois et al (eds), *Uncertainty in Artificial Intelligence*. Morgan Kaufmann, San Mateo, CA, 1992.

Parrish, S.H., L.A. Cox, Jr., Y. Qiu, and W. Kuehner, 1992. "Planning for optimal expansion of leased line communication networks," *Annals of Operations Research*, **36**, 347-364.

Cox, L.A., Jr., "Biological basis of carcinogenesis: Insights from benzene," *Risk Analysis*, **11**, 3, 453-464, 1991.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1947351&dopt=Abstract

Cox, L.A., L. Davis, and Y. Qiu, 1991. "Dynamic anticipatory routing in circuit-switched telecommunications networks," pages 124-143 in L. Davis (ed), *Handbook of Genetic Algorithms*. McGraw-Hill, New York

Cox, L.A., Jr., "Knowledge-based resolution of conflicting expert opinions," *J. Applied Statistics*, **18**, 1, 23-34, 1991.

Hermansky, H., and Cox, L.A., Jr., "Perceptual linear predictive (PLP) analysis-resynthesis technique," *Eurospeech 91, 2nd European Conference on Speech Communication and Technology*. Genoa, Italy, September, 1991.

Cox, L.A., Jr., "Uncertain temporal logics for risk analysis," pp 1-13 in B.J. Garrick and W.C. Gekler (eds), *The Analysis, Communication, and Perception of Risk*. (Volume 8 in *Advances in Risk Assessment* series.) Plenum Press, New York, 1991.

Cox, LA, Jr., "Extending biologically-based cancer risk modeling to apply to benzene-induced leukemogenesis," in B.J. Garrick and W.C. Gekler (eds), *The Analysis, Communication, and Perception of Risk*. Plenum Press, New York, 1991.

Cox, L.A., Jr., "Assessing cancer risks: From statistical to biological models," *J. Energy Engineering*, **116**, 3, 189-210, 1990

Cox, L.A., Jr., "Incorporating statistical information into expert classification systems to reduce classification costs," *Annals of Mathematics and Artificial Intelligence*, **2**, 93-108, 1990.

Cox, L.A., Jr., "Pragmatic information-seeking strategies in expert classification systems," in D. Brown and C. White (eds), *Operations Research and Artificial Intelligence: The Integration of Problem-Solving Strategies*. Kluwer, New York, 1990.

Cox, L.A., Jr., and P.F. Ricci, "Health risk assessment: Production of electricity," *J. Energy Engineering*, **116**, 3, 130-147, 1990.

Cox, L.A., Jr., "A probabilistic risk assessment program for analyzing security risks," pp 331-340 in L.A. Cox, Jr., and P.F. Ricci (eds), *New Risks: Issues and Management*. Plenum Press, New York, 1990.

Cox, L.A., Jr., "Managing uncertain risks through 'intelligent' classification: A combined artificial intelligence/ decision analysis approach," pp 473-482 in J.J. Bonin and D.E. Stevenson (eds), *Risk Assessment in Setting National Priorities*. Plenum Press, New York, 1989.

Cox, L.A., and P.F. Ricci, "Legal and philosophical aspects of risk analysis," Chapter 30 in D.J. Paustenbach (ed), *The Risk Assessment of Environmental and Human Health Hazards: A Textbook of Case Studies*. Wiley, New York, 1017-1046, 1989

Cox, L.A., and P.F. Ricci, "Risk, uncertainty, and causation: Quantifying human health risks." Chapter 2 in D.J. Paustenbach (ed), *The Risk Assessment of Environmental and Human Health Hazards: A Textbook of Case Studies*. Wiley, New York, 1989, 125-157.

Cox, L.A., Jr., Y. Qiu, and W. Kuehner, "Heuristic least-cost computation of discrete classification functions with uncertain argument values," *Annals of Operations Research*, **21**, 1-30, 1989.

Ricci, P.F., L.A. Cox, Jr., and J.P. Dwyer, "Acceptable cancer risks: Probabilities and beyond," *J. Air Pollution Control Association (JAPCA)*, **39**, 8, 1046-1053, 1989.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=2677256&dopt=Abstract

Cox, L.A., Jr., "Comparative risk measures for heterogeneous populations," in A. Woodhead, M.A. Bender, and R.C. Leonard (eds), *Phenotypic Variations in Populations: Relevance to Risk Assessment*. Plenum Press, New York, 1988. Also in *Basic Life Sci* 1988;43:233-43.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3365220&dopt=Abstract

Cox, L.A., Jr., "Statistical issues in the estimation of assigned shares for carcinogenesis liability," *Risk Analysis*, 7, 1, 71-80, 1987.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3615994&dopt=Abstract

Cox, L.A., Jr., "Economic theory of compensation rule design for probabilistic injuries." In Lester B. Lave (Ed.), *Risk Assessment and Management*. Plenum Press, 1987. 407-420.

Ricci, P.F., and L.A. Cox, Jr., "Acceptability of chronic health risks," *Toxics Law Reporter*, 1, 35, 986-1001, 1987.

Ricci, P.F., L.A. Cox, Jr., and M. Baram, "De minimis considerations in health risk assessment," *J. Hazardous Materials*, 15, 1987.

Cox, L.A., Jr., "Technical and policy issues in assigned share calculations: A comment on Lagakos and Mosteller," *Risk Analysis*, 6, 3, 373-376, 1986

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3602509&dopt=Abstract

Cox, L.A., Jr., "Theory of regulatory benefits assessment: Econometric and expressed preference approaches," Chapter 5, pages 85-159 in J.D. Bentkover *et al.* (eds), *Benefits Assessment: The State of the Art*. Reidel, Boston, 1986.

Cummings, R.G., L.A. Cox, Jr., and A. Myrick Freeman, III, "General methods for benefits assessment," Chapter 6 in J.D. Bentkover *et al.* (eds), *Benefits Assessment: The State of the Art*. Reidel, Boston, 1986.

Fischhoff, B., and L.A. Cox, Jr., "Conceptual framework for regulatory benefits assessment," Chapter 4 in J.D. Bentkover *et al.* (eds), *Benefits Assessment: The State of the Art*. Reidel, Boston, 1986.

Cox, L.A., Jr., "A new measure of attributable risk for public health applications," *Management Science*, 31, 7, 800-814, 1985

Cox, L.A., Jr., and I. Plotkin, "The economic foundations of limited liability for nuclear reactor accidents," in *The Price-Anderson Law: Six Reports on Price-Anderson Issues*. American Nuclear Insurers and Liability Underwriters, Hartford, Connecticut, 1985.

Cox, L.A., Jr., and J. Fiksel, "A critical review of the probability of causation method," in *The Price-Anderson Law: Six Reports on Price-Anderson Issues*. American Nuclear Insurers and Liability Underwriters, Hartford, Connecticut, 1985.

Fiksel, J., and L.A. Cox, Jr., "The process analysis approach," in P.F. Ricci and M.D. Rowe (eds), *Assessing Health Impacts of Energy Technologies at the National and Regional Levels*. Pergamon Press, New York, 1984.

Cox, L.A., Jr., "Probability of causation and the attributable proportion of risk". *Risk Analysis*, 4, 221-230, 1984.

Cox, L.A., Jr., and J. Fiksel. "Quantifying the causes of cancer". Letter to the Editor, *Risk Management*, July, 1984.

Cox, L.A., Jr., J. Fiksel, A.S. Kalelkar, and P.F. Ricci. Occupational risks of energy production. *Nuclear Safety*, 24, 4, 459-470, 1983.

Fiksel, J., L.A. Cox, Jr., D.L. Richardson, and A. Adamantiades, "Selection of nuclear safety R&D projects through value-impact analysis," *Nuclear Safety*, 24, 1, 1983.

Cox, L.A., Jr., "Artifactual uncertainty in risk analysis," *Risk Analysis*, 2, 3, 1982.

Murray, C.A., and L.A. Cox, Jr., "The suppression effect and the institutionalization of children," pp 653-666 in L. Sechrest (ed), *Evaluation Studies Review Annual, Volume 4*. Sage Publications, Beverly Hills, CA, 1979.

PUBLISHED CONFERENCE PROCEEDINGS

Cox, L.A., Jr., L. Lu, J. Sanchez, X. Sun, "Cost savings from network optimization of DWDM facilities and optical switches". In *Proceedings of the 8th International Conference on Telecommunications Systems: Modeling and Analysis*. Vanderbilt University, Nashville, Tennessee, March 9-12, 2000.

Cox, L.A., Jr., "Predicting and optimizing customer behaviors." In *Proceedings of the 8th International Conference on Telecommunications Systems: Modeling and Analysis*. Vanderbilt University, Nashville, Tennessee, March 9-12, 2000.

Cox, L.A., Jr., "Causal mechanisms and classification trees for predicting chemical carcinogens." In David Heckerman and Joe Whittaker (editors). *Proceedings of the Seventh International Workshop on Artificial Intelligence and Statistics*. Morgan Kaufmann Publishers, Inc., San Francisco, CA, 1999. <http://uncertainty99.microsoft.com/proceedings.htm>

Cox, L.A., Jr., Dose-response relationships and benzene toxicology in *Proceedings of The Toxicology Forum, 22nd Annual Winter Meeting*. Toxicology Forum, Inc., 1997.

Cox, L.A., Jr., "PM 2.5 and diesel exhaust health risks: Statistical vs. causal associations". Proceedings of the U. California, Riverside and The California Trucking Association Conference on *Meeting the Environmental Challenge of the 21st Century*. World Truck Conference, Treasure Island Resort Hotel, Las Vegas, Nevada. May 13-15, 1997.

Cox, L.A., Jr., "Learning approximately optimal planning trees from complex multivariate data sets with the help of a causal theory", in I.H. Osman and J. Kelly (eds), *Proceedings of the Metaheuristics International Conference*. Kluwer, Norwell, MA., pp 287-294, 1995.

Cox, L.A., Jr., X. Sun, and Y. Qiu, "Optimal and heuristic search for a hidden object in one dimension." *Proceedings of the 1994 IEEE International Conference on Systems, Man, and Cybernetics. Volume 2*. San Antonio, Texas, October 2-5, 1994.

Qiu, Y., and L.A. Cox, Jr., "Optimal search for failed components in renewable coherent systems," *Proceedings of the 1994 IEEE International Conference on Systems, Man, and Cybernetics, Volume 2*. San Antonio, Texas, October 2-5, 1994.

Davis, L.D., Y. Qiu, L.A. Cox, Jr., and D. Orvosh, "A genetic algorithm for survivable network design", *Proceedings of the 5th International Conference on Genetic Algorithms*. Morgan Kaufmann, 1993.

Cox, L.A., Jr., "Heuristic approaches to dynamic path assignment," in *Proceedings of the First International Workshop on Operations Research in Telecommunications*, Boca Rotan, Florida, March, 1990.

Cox, L.A., Jr., "Designing expert classification systems that acquire expensive information optimally" in J. Boose *et al* (eds), *Proceedings of the European Knowledge Acquisition Workshop for Knowledge-Based Systems*. Gesellschaft für Mathematik und Datenverarbeitung MBH, GMD-Studien Nr. 143, Bonn, Germany, 1988.

Cox, L.A., and R. Blumenthal, "KRIMB: An intelligent knowledge acquisition and representation program for interactive model building," in T. Addis *et al* (eds), *Proceedings of the First European Workshop on Knowledge Acquisition for Knowledge-Based Systems*. Reading University Press, Reading, England, 1987.

Cox, L.A., Jr. and R. Blumenthal, "Dynamic planning under uncertainty using automated model construction and risk analysis," *Proceedings of the 1987 Workshop on Simulation and Artificial Intelligence*. Seattle, WA, 1987.

Cox, L.A., Jr., "ATAM: A personal computer modeling system for security threat assessment," *Proceedings of the 2nd Annual Symposium of Physical/Electronic Security*. Philadelphia Chapter, Armed Forces Communications and Electronics Association, Philadelphia, PA, 1986

PUBLISHED ABSTRACTS

Cox, L.A., Jr., and M.B. Paxton, "A computer model of hematotoxicity explaining experimental and clinical data for cyclophosphamide and benzene". Invited poster presented at the SOT Poster/Discussion session on "Benzene -- Toxicity, Mechanisms, and Pharmacokinetics", Abstract #839. 36th Annual Meeting of the Society of Toxicology. Cincinnati Convention Center, March 11, 1997

Cox, L.A., Jr. and F.B. Thomas, "A generic PBPK modeling tool for rapidly developing PBPK models," *The Toxicologist*, **12**, 1, abstract # 684, p. 188, February, 1992.

Cox, L.A., Jr., M.G. Bird, W. Lampson, and S.J. Wykoff, "An expert database management tool for biological effects of chemicals," *The Toxicologist*, **12**, 1, abstract # 1376, p. 352, February, 1992.

Cox, L.A., Jr., "Data mining and causal simulation modeling of customer behaviors". Fifth INFORMS Telecommunications Conference. March, 2000.
<http://www.crt.umontreal.ca/GERAD/boca2000/T00003.html>

Bell G. and Cox, L.A., Jr., "Optimizing Dark Fiber Use in Metropolitan Areas", *Sixth INFORMS Telecommunications Conference*, Boca-Raton, Florida, March 10-13, 2002.
<http://www.informs.org/Conf/Telecom02/Abstracts/Cox01336062645.pdf>

Cox, L.A., Jr., "What is the cost of a DS3?". Invited talk, *Sixth INFORMS Telecommunications Conference*, Boca-Raton, Florida, March 10-13, 2002.
http://www.informs.org/Conf/Telecom02/Abstracts/Cox_network_cost_abstract.pdf

Babayev D. and Cox, L.A., Jr., "Least-Cost Acquisition of Service Facilities via Spatial Clustering", *Sixth INFORMS Telecommunications Conference*, Boca-Raton, Florida, March 10-13, 2002. <http://www.informs.org/Conf/Telecom02/Abstracts/Cox01356165150.pdf>

Cox, L.A., Jr., "Predicting Likely Telecom Service Buyers by Mining D&B and Billing Data", *Sixth INFORMS Telecommunications Conference*, Boca-Raton, Florida, March 10-13, 2002. <http://www.informs.org/Conf/Telecom02/Abstracts/Cox01361002535.pdf>

SELECTED MAJOR TECHNICAL REPORTS

1. *Following Instructions*. American Institutes for Research in the Social and Behavioral Sciences (AIR), Washington, D.C., 1980. (With A.M. Rose)
2. *Development, Application, and Evaluation of a Value-Impact Methodology for Prioritization of Reactor Safety R&D Projects*. EPRI Report RP-1810-2, Electric Power Research Institute, Palo Alto, CA, 1982. (with J. Fiksel and D.L. Richardson)
3. *Methods for Risk Analysis of the Transportation of Hazardous Materials*. Final Report to the Openbaar Lichman Rijnmond. Arthur D. Little, Inc., Cambridge, MA, 1982. (with A.S. Kalelkar and L.M. Bendixen)
4. *A Workshop on Dealing with Uncertainty in Risk Analysis*. Final Report to the Division of Policy Research and Analysis (PRA), National Science Foundation. Arthur D. Little, Inc., Cambridge, MA, 1983. (with H. Ojha, J. Fiksel)
5. *PERCO: A Model for Prioritization of Environmental Risks and Control Options at Hazardous Waste Sites*. Final Report to the Massachusetts Department of Environmental Quality Engineering (DEQE). Arthur D. Little, Cambridge, MA, 1983. (with J. Fiksel)
6. *Principles for the Use of De Minimis Concepts in Risk Regulation*. Final Report to the Division of Policy Research and Analysis (PRA), National Science Foundation. Arthur D. Little, Inc., Cambridge, MA, 1984. (with J. Fiksel, M.S. Baram, and J.R. Miyares)
7. *Analysis of Routine Occupational Risks Associated with Selected Electrical Energy Systems*. EPRI Report EA-4020, Electric Power Research Institute, Palo Alto, CA, 1985 (with A.S. Kalelkar and J. Fiksel)
8. *An Automated Threat Assessment Methodology for Security Risk Analysis*. Final Report to the U.S. Air Force Computer Security Program Office (AFCSPPO). Arthur D. Little, Inc., Cambridge, MA, 1986.
9. *A Conceptual Framework for Research Planning at the Health Effects Institute*. Final Report to the Health Effects Institute (HEI), Arthur D. Little, Inc., Cambridge, MA, 1986.
10. *Predictions of Future Cancer Incidence Rates Among Nuclear Power Plant Employees*. Final Report to the American Nuclear Insurers and Mutual Atomic Energy Underwriters. Arthur D. Little, Inc., Cambridge, MA, 1987 (with J. Fiksel and G.S Young).
11. *Reassessing the Internal Doses in Humans and Animals from Inhalation of Butadiene*. Report to the Chemical Manufacturers Association. Cox Associates, Denver, CO, November, 1989.

12. *New Directions in Cancer Modeling and Risk Assessment for Benzene*. Final Report to the Western States Petroleum Association. Cox Associates, Denver, CO, July, 1990.
13. *Reassessing the Risks of Chemical Carcinogens using PBPK Models: Benzene as an Example*. Report to the American Petroleum Institute. Cox Associates, Denver, CO, December, 1990.
14. *Techniques and Methodology for Dealing with Scientific Uncertainties in Biologically-Based Risk Assessment*. Report to the Western States Petroleum Association. Cox Associates, Denver, CO, February, 1991.
15. *STEM: A Data Acquisition and Management System for Exploring Biological Effects of Chemicals*. Report to Exxon Biomedical Sciences, Inc. Cox Associates, Denver, CO, June, 1991.
16. *Deterministic Biomathematical Models for Risk Modeling*. Report to the API/WSPA Biologically-Based Risk Assessment Working Group. Cox Associates, Denver, CO, October, 1991.
17. *Uncertainty Analysis of PBPK Models*. Final Report to the American Industrial Health Council Delivered Dose Working Group. American Industrial Health Council, Washington, D.C., December, 1992.
18. *Basic Biology Review and Biomathematical Modeling of Normal Blood Cell Proliferation*. American Petroleum Institute, Washington, D.C., 1993.
19. *Managing Statistical Uncertainties in PBPK Modeling*. American Industrial Health Council (AIHC), Washington, D.C., October, 1993.
20. *A Unifying Class of Linear Compartmental Flow Models of Carcinogenesis*. Report to the American Industrial Health Council (AIHC). Cox Associates, Denver, CO, January, 1994.
21. *Internal Dose and Uncertainty Analysis of Complex Risk Models*. Report to the American Industrial Health Council (AIHC). Cox Associates, Denver, CO, January, 1994.
22. *An Exact Analysis of the Multistage Model Explaining Dose-Response Concavity*. Report to the American Industrial Health Council (AIHC). Cox Associates, Denver, CO, February, 1994.
23. *Dealing with Uncertainties in a Biologically-Based Risk Assessment Model of Cyclophosphamide-Induced Leukemogenesis*. American Petroleum Institute, Health and Environmental Science. Report # DR70. Washington, D.C. May, 1994.

24. *Data Analysis and Risk Modeling of Lung Tumor Risks from Diesel Exhaust*. Report to the Western States Petroleum Association. Cox Associates, Denver, CO, March, 1995.
25. *Comments on EPA's Proposed Decisions on Standards for Particulate Matter and Ozone*. Final Report to the Engine Manufacturers Association. Cox Associates, Denver, CO. March 8, 1997. 38 pages
26. *Technical and Policy Issues in Regulating Particulate Matter (PM) Air Pollution: An Information Primer*. Draft Report to the American Petroleum Institute. Cox Associates, Denver, CO. March 31, 1997. 50 pages
27. *U S WEST Customer Attrition Modeling: Learning to Predict Customer Attrition Risk From Data*. Final Report to U S WEST Communications. Cox Associates, Denver, CO. August 14, 1997. 36 pages + Appendices
28. *Comments On OEHHA's 1997 Draft Risk Assessment For Diesel Exhaust*. Final Report to the Engine Manufacturers Association. Cox Associates, Denver, CO. 8-20, 1997. 34 pages.
29. *A Method to More Accurately Forecast Demand for Local Loop Products*. Final Report to U S WEST Communications. Cox Associates, Denver, CO. September 5th, 1997. 24 pages.
30. *Next Optimal Product Project: Optimal Statistical Matching of Product Offers to Customer Needs*. Final Report to U S WEST Communications. Cox Associates, Denver, CO. December 29th, 1997. 20 pages + Appendices
31. *TCI Customer Acquisition and Loss Model*. Final Report to TCI. Cox Associates, Denver, CO. January 9th, 1998. 31 pages + Appendices
32. *Comments On OEHHA's February, 1998 Draft Risk Assessment For Diesel Exhaust*. Final Report to the Engine Manufacturers Association. Cox Associates, Denver, CO. April 13th, 1998. 47 pages.
33. *Demographic Clusters Predicting Perceived Service Quality: Summary. Report to TCI*. Cox Associates, Denver, CO. April 17th, 1998. 8 pages.
34. *Minimizing Monthly Lease Costs in AT&T Wireless's Denver-Area Backhaul Network: Results of a Pilot Project on Cost Reduction*. Draft Report to AT&T Wireless. Cox Associates, Denver, CO. May 18th, 1998.
35. *Switch Capacity and Resources: Technical Background for Forecasting*. Report to U S WEST Advanced Technologies. Cox Associates, Denver, CO. July 30th, 1998. 15 pages + appendices and hyperlinks

36. *A Statistical Decision Approach for Sampling Ordnance and Explosives*. Final Report to the Army U.S. Army Corps of Engineers, Huntsville, Alabama. Montgomery Watson, Inc., Salt Lake City, UT and Cox Associates, Denver, CO. September, 1998. 39 pages.
37. *Network capacity forecasting and planning process: Results of a planning workshop*. Final report to A T & T Wireless Systems, National Business Planning. Cox Associates, Denver, CO. December 30, 1998. 19 pages plus appendices.
38. *Minimizing network facility costs via DWDM overlays: Results of a pilot project on cost reduction*. Final report to Tellium. Cox Associates, Denver, CO. April 15th, 1999. 19 pages plus appendices.
39. *An Investigation of System Identification Techniques for Simulation Model Abstraction*. Final Technical Report, Air Force Research Laboratory Information Directorate. Rome Research Site. Rome, New York. February, 2000. 84 pages. (with D.A. Popken)
40. *Review of Uncertainty and Variability Analysis In IRIS for Eight Substances*. Final Report to Versar. Cox Associates, Denver, CO. June 14th, 2000. 28 pages plus appendices. http://www.epa.gov/ncea/hlthfx_iris.htm
41. *Optical Network Design Tools: Optimization Software to Support Migrating to Optical Networks*. Final Report to Nortel Networks. Cox Associates, Denver, CO. July 2000. 45 pages plus appendices.
42. *A Rapid Study of Classic U S WEST Business Customer Attrition and Purchases: Results*. Final Report to Qwest Communications. Cox Associates, Denver, CO. December, 2000. 36 pages.
43. *A Dynamic Simulation Model of Campylobacter Illnesses*. Final Report to Animal Health Institute. Cox Associates, Denver, CO. February, 2001. 68 pages plus appendices.
44. *Quantifying Public Health Risk Reduction Benefits*. AWWA Research Foundation, 2002. (Raucher, R.S. et al.) 205 pages + appendices.

LOUIS ANTHONY COX, JR., PH.D.
SELECTED TALKS, LECTURES, AND PRESENTATIONS

1. "Biological bases of low-dose nonlinearity for chemical carcinogens," invited talk presented at the Society for Risk Analysis Annual Meeting, New Orleans, Hotel Intercontinental, October 7-10, 1990.
2. "Biologically-based risk assessment," invited seminar given to the EPA and the Chemical Industry Institute of Toxicology, Research Triangle Park, North Carolina, May 22, 1991.
3. "Dealing with uncertainty in PBPK modeling," presentation to the American Industrial Health Counsel (AIHC) Delivered Dose Working Group, Washington, D.C., November 14, 1991.
4. "PBPK modeling in biologically-based risk analysis," invited talk to the Houston Chapter of the Society for Risk Analysis, Houston, TX, November 20, 1991.
5. "Why offer doctoral programs in risk analysis?," invited presentation and panel discussion at the Society for Risk Analysis Annual Meeting, Baltimore, MD, December, 1991.
6. "Challenges and promises of risk assessment," invited seminar presented to the U S Department of Agriculture's APHIS program, Hyattsville, MD, January 7, 1992.
7. "Recent advances in decision analysis," invited graduate seminar presented at the University of Colorado business school, March 18, 1992.
8. "Economic research and modeling in the telecommunications industry," invited talk given at the Public Utilities Regulatory Training Institute (PURTI) visit to U S WEST Advanced Technologies, May, 1992.
12. "New methods for calculating upper confidence bounds of multistage dose-response models," invited seminar given at the California Environmental Protection Agency, Berkeley, CA, September 4, 1992.
13. "Scientific research needs in benzene risk assessment," invited presentation and panel discussion presented at the American Petroleum Institute workshop on Mechanisms of Benzene Toxicity as a Basis for Risk Assessment, Airlie Foundation, Warrenton, VA, September 21-23, 1992.
14. "Decisions with unknown consequences: A random valuation model," presented at the Society for Risk Analysis 1992 Annual Meeting, December 6-9, Hotel del Coronado, San Diego, CA, December 6-9. 1992.

15. "Relating biologically-based risk models to population data," presented at the Society for Risk Analysis 1992 Annual Meeting, December 6-9, Hotel del Coronado, San Diego, CA, December 6-9. 1992.
16. "Incorporating biological response information into risk prediction," poster presented at the Society for Risk Analysis 1992 Annual Meeting, December 6-9, Hotel del Coronado, San Diego, CA, December 6-9. 1992.
17. "Minimizing the average costs of fault diagnosis in complex systems," poster presented at the *Fourth International Workshop on Artificial Intelligence and Statistics*, Fort Lauderdale, Florida, January 4-6, 1993.
18. "Uncertainty analysis of complex risk models: Bayesian and non-Bayesian approaches" invited seminar presented at the Harvard School of Public Health, January 26, 1993.
19. "New approaches to confidence band estimation in parametric statistical models," invited seminar presented at the Environmental Protection Agency, February 8, 1993.
20. "Statistical and artificial intelligence analysis of isoprene bioassay data", talk presented at Battelle Columbus Laboratories, September 25, 1993.
21. "Optimal project selection in a stochastic funding model", talk presented (with L. Lu and Y. Qiu) at the ORSA/TIMS Joint National Meeting, Hyatt Regency, Phoenix Arizona, October 31-November 3, 1993.
22. "A biologically-based risk assessment (BBRA) model of leukemogenesis induced by cyclophosphamide", Poster presented by Dr. Mary Paxton at the workshop on *Biological Mechanisms and Quantitative Risk Assessment: From Experimental Design to Risk Characterization*. Research Triangle Park, North Carolina, November 1-4, 1993.
23. "Coping with uncertainties in a computer simulation model of cyclophosphamide-induced leukemogenesis," invited talk, 1993 Annual Meeting of the Society for Risk Analysis, Savannah, Georgia, December 5-8, 1993.
24. "Machine learning for uncertainty management in complex risk models", invited talk presented at The Institute of Management Sciences (TIMS) and Operations Research Society of America (ORSA) joint meeting, Boston Marriott Copley Place, Boston, Massachusetts, April 24-27, 1994.
25. "Reducing the expected costs of classification trees through local search" (presented with X. Sun and Y. Qiu), invited talk, TIMS/ORSA joint meeting, Boston Marriott Copley Place, Boston, Massachusetts, April 24-27, 1994.

26. "Planning survivable interoffice networks using SPT", (coauthored with and presented by Y. Qiu), invited talk presented at TIMS/ORSA joint meeting, Boston Marriott Copley Place, Boston, Massachusetts, April 24-27, 1994.
27. "Least-cost inspecting and repairing strategies for multicomponent systems," (with X. Sun and Y. Qiu), invited talk presented at The Institute of Management Sciences (TIMS) 1994 annual conference, University of Alaska at Anchorage, June 12-15, 1994.
28. "More informative confidence limits for dose-response functions using Monte-Carlo simulation: The Data Cube approach." Invited seminar presented at the California EPA, Office of Environmental Health Hazard Assessment, Berkeley, CA, August 12, 1994.
29. "New frontiers in toxicology information: Technologies of the information superhighway." Keynote address, *21st Annual Toxicology Information Roundtable*, MICROMEDEX Toxicology, Medicine, and Environmental Series, Westin Hotel at Tabor Center, Denver, Colorado, October 13, 1994.
30. "Nonlinear dose-time-response relations for chemical leukemogens: Computer simulation of the roles of cell kinetics and hematotoxicity." Invited talk presented at the *Symposium on Recent Developments in Benzene Epidemiology and Toxicology*. Villa Florence Hotel. San Francisco, CA. November 29-30, 1994.
31. "A simulation method for constructing more informative upper confidence limits on dose-response functions," invited talk presented at the 1994 Annual Meeting of the Society for Risk Analysis, Hyatt Regency at the Inner Harbor, Baltimore, MD, December 4-7, 1994.
<http://www.riskworld.com/Abstract/1994/sraam94/ab4aa072.htm>
32. "Nonlinear cell kinetics can explain observed anomalies in dose-time-response patterns," Poster session (presented with Dr. M.B. Paxton), 1994 Annual Meeting of the Society for Risk Analysis, Hyatt Regency at the Inner Harbor, Baltimore, MD, December 4-7, 1994.
<http://www.riskworld.com/Abstract/1994/sraam94/ab4aa249.htm>
33. "Automated visualization and discovery of predictively useful biological response profiles in complex data set" (with Dr. M. Bird), presented at the 1994 Annual Meeting of the Society for Risk Analysis, Hyatt Regency at the Inner Harbor, Baltimore, MD, December 4-7, 1994.
34. "PBPK modeling and mechanistic risk assessment: Using scientific information to improve risk assessment." Lecture given at the CACI/CDPHE Risk Assessment Workshop, Denver, CO, January 31, 1995.

35. "Reassessing benzene risks using internal doses and Monte-Carlo uncertainty analysis", invited talk presented at Benzene '95, Rutgers, New Jersey, June, 1995.
36. "Analysis of isoprene bioassay data: Risk assesment implications", invited talk presented at the International Symposium: Evaluation of Butadiene and Isoprene Health Risks", Blaine, Washington, June 27-29, 1995.
37. "Reanalyzing human lung cancer risks from diesel exhaust using a multivariate risk model", invited talk presented at the Diesel Risk Assessment Workshop, San Francisco, January 29-30, 1996.
38. "Biomathematical modeling of chemically-induced myelotoxicity and potential applications to t-AML risk modeling", invited talk presented at the University of California, Berkeley Workshop on *Modeling Chemically-Induced Leukemia -- Implications for Benzene Risk Assessment*. Yountville, CA, February 11-13, 1996. (Report by M.T. Smith and E.W. Fanning published in *Leukemia Research*, 1997.)
39. "Scheduling switch replacements with randomly decreasing deadlines", with S. Chiu and Y. Lee, presented at INFORMS 96, Washington, D.C., May 5-8, 1996.
40. "Optimal design of digital wireless networks" (with S. Chiu, J. Ryan, V. Corlew, S. Raghavan), presented by Dr. S. Chiu at IFORS Conference, Vancouver, May, 1996.
41. "A network design problem for multimedia broadband networks," presented by Dr. Cox for Dr. Y. Lee at INFORMS Spring meeting, Washington, D.C., May 5-8, 1996.
42. "Stochastic optimization in classification trees." *Fifth Society for Industrial and Applied Mathematics Conference on Optimization*, Victoria, British Columbia, May 20-22, 1996.
43. "Using data to improve business performance: Techniques and applications", invited talk given at the *Electric Power Research Institute (EPRI) 1996 Performance Measurement Workshop*. Loews Giorgio Hotel, Denver, CO. November 7, 1996.
44. "Uncertainty analysis of complex risk models," invited talk presented at the Society for Risk Analysis and International Society of Exposure Analysis, 1996 Annual Meeting, Fairmont Hotel, New Orleans, December 8-12, 1996.
<http://www.riskworld.com/Abstract/1996/SRAam96/ab6aa088.htm>
45. "Decision models for uncertain hazards", invited talk presented at the Society for Risk Analysis and International Society of Exposure Analysis, 1996 Annual Meeting, Fairmont Hotel, New Orleans, December 8-12, 1996.
<http://www.riskworld.com/Abstract/1996/SRAam96/ab6aa134.htm>

46. "Using classification trees to improve causal inferences in observational studies." Presented at the *Sixth International Workshop on Artificial Intelligence and Statistics*. Fort Lauderdale, Florida. January 4-7, 1997.
47. Testimony on health effects of particulate matter. Presented on behalf of the Engine Manufacturers Association at EPA's Public Hearings on Ozone and Particulate Matter National Ambient Air Quality Standards. Salt Lake City, January 14, 1997.
48. "Adaptive spatial sampling for inspection and cleanup at hazardous waste sites". Invited seminar given at AlliedSignal, Morristown, New Jersey. January 28, 1997.
49. "Dose-response relationships and benzene toxicology." Invited talk presented at the Toxicology Forum, 22nd Annual Winter Meeting. Loews L'Enfant Plaza Hotel, Washington, D.C. February 24-27, 1997.
50. "A computer model of hematotoxicity explaining experimental and clinical data for cyclophosphamide and benzene". Invited presentation, with Dr. M.B. Paxton, at the SOT Poster/Discussion session on "Benzene -- Toxicity, Mechanisms, and Pharmacokinetics", Abstract #839. 36th Annual Meeting of the Society of Toxicology. Cincinnati Convention Center, March 11, 1997.
51. "Heuristics for improved design of telecommunications networks and services". Invited lecture in graduate seminar on Advanced Topics in Optimization. University of Colorado at Boulder. April 23, 1997.
52. "Nonlinear dose-time-response models for chemical carcinogens." Invited seminar, hosted by the University of Colorado at Denver Biomathematics Seminar, Denver, Colorado. April 30, 1997.
53. "Optimal sequential inspection of complex reliability systems with uncertain structure function and component reliabilities." Invited talk, presented at the INFORMS Spring meeting, San Diego, May 4-7, 1997.
54. "An integrated business simulation model for PCS companies." Invited talk, INFORMS Spring meeting, San Diego, May 4-7, 1997. (With W. Kuehner, K. Paige, J. Parker)
55. "Optimizing PCS backhaul networks: Should wireless network engineers care?" Invited talk, presented at the INFORMS Spring meeting, San Diego, May 4-7, 1997.
56. "Optimization modeling therapy for large, disorganized companies". Invited talk, presented at the INFORMS Spring meeting, San Diego, May 4-7, 1997.
57. "PM 2.5 and diesel exhaust health risks: Statistical vs. causal associations". Invited talk presented at University of California, Riverside and The California Trucking

Association Conference on *Meeting the Environmental Challenge of the 21st Century*. World Truck Conference, Treasure Island Resort Hotel, Las Vegas, Nevada. May 13-15, 1997.

58. "A computer model of hematotoxicity explaining experimental and clinical data." Invited seminar, hosted by the University of Colorado at Denver Biomathematics Seminar, Denver, Colorado. November 19, 1997.
59. "Adaptive spatial sampling for investigating and remediating contaminated properties." Poster session presented at the Society for Risk Analysis 1997 Annual Meeting. Capitol Hilton Hotel, Washington, D.C., December, 1997.
<http://www.riskworld.com/Abstract/1997/SRAam97/ab7ab384.htm>
60. "Directed acyclic graph algorithms for interpreting causality in ambiguous epidemiological data". Invited seminar, hosted by the University of Colorado at Denver's Biomathematics Seminar Series, Denver, Colorado. February 7th, 1998.
61. "Applied mathematics in telecommunications consulting". Invited seminar, hosted by University of Colorado at Denver's Optimization Seminar Series. <http://www-math.cudenver.edu/optima/seminars.html>. February 11, 1998.
62. "Dynamic hierarchical packing minimizes costs of wireless switch capacity expansion." Invited talk presented at the 1998 INFORMS Telecommunications Conference, Sheraton Inn, Boca Rotan, Florida. March 8-11, 1998.
http://www.cstp.umkc.edu/informs-telecom/4th_conf_dir/adv_prog_detail.html
63. "More accurate forecasting of demand for telecommunications products using customer information profiles and purchase transition data." Invited talk presented at the 1998 INFORMS Telecommunications Conference, Sheraton Inn, Boca Rotan, Florida. March 8-11, 1998.
http://www.cstp.umkc.edu/informs-telecom/4th_conf_dir/adv_prog_detail.html
64. "Exact mathematical analysis of multistage carcinogenesis models," Invited seminar, hosted by the University of Colorado at Denver's Biomathematics Seminar Series, Denver, Colorado. April 10th, 1998.
65. "Association vs. causation: Notes and comments on EPA's draft risk assessment for diesel exhaust", presented to the Clean Air Science Advisory Committee (CASAC), Governor's Inn, Research Triangle Park, NC, May 5th, 1998.
66. "Advances in data mining: Case studies from the telecommunications industry." Invited lecture, University of Denver, Daniels School of Business, capstone course in data technologies for business applications, May 11th, 1998.

67. "Advances in biologically-based risk assessment". Invited seminar given at Exxon Biomedical Sciences, Inc., Mettlers Road, New Jersey. June 1, 1998.
68. "New methods for identifying quantitative structure-activity and activity-activity relations." Invited seminar given at Exxon Biomedical Sciences, Inc., Mettlers Road, New Jersey. June 1, 1998.
69. "Simulation-optimization heuristics for sampling contaminated soils." Invited presentation, Biomathematics and Statistics Seminar, University of Colorado at Denver Mathematics Department. September 24, 1998.
70. "Identifying customer demand processes from data." Presentation given (with Dr. Douglas Popken) at INFORMS 98, Seattle Convention Center, October 26th, 1998.
71. "Optimal statistical sampling of contaminated soils." Invited lecture, Seminar in Advanced Topics in Optimization, U. of Colorado at Boulder, December 2nd, 1998
72. "Computational Bayesian methods for assessing uncertain exposures." Lecture in the 1998 Workshop on *Probabilistic Methods in Risk Assessment*. Society for Risk Analysis Annual Meeting, Phoenix, Arizona. December 6th, 1998.
73. "Axiomatic Definitions of Risk". Poster presented at Society for Risk Analysis Annual Meeting, Phoenix, Arizona. December 9th, 1998.
<http://www.sra.org/events.htm#annual>
74. "A simulation-optimization approach to cost-effective sampling and cleanup of contaminated areas." Talk presented at the Society for Risk Analysis 1998 Annual Meeting, Phoenix, Arizona. December 9th, 1998. <http://www.sra.org/events.htm#annual>
75. "A biologically motivated model of hematotoxicity: Model overview and empirical evaluation." Presented at the *Hematotoxicity Modeling Workshop*, Institute of Population Health, University of Ottawa. December 15th, 1998.
76. "Causal mechanisms and classification trees for predicting chemical carcinogens." Presented (by Professor D. Fisher for L.A. Cox) at the *Seventh International Workshop on Artificial Intelligence and Statistics*. Fort Lauderdale, Florida. January 3-6, 1999. <http://uncertainty99.microsoft.com/proceedings.htm>
77. "Applied mathematics in telecommunications consulting." Invited lecture in Undergraduate Mathematics Seminar, University of Colorado at Denver, March 8th, 1999. <http://www.cudenver.edu/~hgreenbe/courses/3001/S99/syllabus.html>
78. "Causal data mining and modeling of customer data." Invited lecture, University of Denver, Daniels School of Business, capstone course in data technologies for business applications, April 29th, 1999.

79. "Optimal use of acquired network facilities." Invited presentation, INFORMS '99, Cincinnati Convention Center, May 3rd, 1999.
80. "Valid and invalid causal inferences in epidemiology." Invited talk, CU-Denver Statistics and BioMath Seminar, September 14th, 1999.
81. "An axiomatic approach to attributable risk," CU-Denver Statistics and BioMath Seminar, October 19th, 1999.
82. "Forecasting purchases of telecommunications services via state transition models", with Dr. Doug Popken. INFORMS Fall '99, Philadelphia, November 7-10, 1999.
<http://www.informs.org/Conf/Philadelphia99//TALKS/TE13.html>
83. "Causal data mining of telecommunications customer data", INFORMS Fall '99, Philadelphia, November 7-10, 1999.
<http://www.informs.org/Conf/Philadelphia99//TALKS/TE13.html>
84. "Mathematical validity of CVM Risk Assessment." Invited review of antimicrobial risk assessment, presented at U.S. Food and Drug Administration College of Veterinary Medicine (CVM)'s Draft Risk Assessment and the Establishment of Resistance Thresholds Workshop, December 9th and 10th, 1999. DoubleTree Hotel, Rockville, MD. <http://www.fda.gov/cvm/antimicrobial/tonycox/index.htm>
85. "Optical network planning and optimization in metropolitan areas." Invited talk at Institute for International Research Conference on *Transitioning to the Next Generation Metropolitan Network Using DWDM*. Wyndham Miami Beach Resort, February 14-15, 2000.
86. "Data mining and causal simulation modeling of customer behaviors". Tutorial presented at Fifth INFORMS Telecommunications Conference. Sheraton Boca Raton Hotel, Boca Raton, Florida, March 5-8, 2000.
<http://www.crt.umontreal.ca/GERAD/boca2000/monday.shtml#ma>
87. "Cost savings from network optimization of DWDM facilities and optical switches". Presented at 8th *International Conference on Telecommunications Systems: Modeling and Analysis*. Vanderbilt University, Nashville, Tennessee, March 9-12, 2000.
88. "Predicting and optimizing customer behaviors." Presented at 8th *International Conference on Telecommunications Systems: Modeling and Analysis*. Vanderbilt University, Nashville, Tennessee, March 9-12, 2000.
89. "Attributable risk and multiple causes." Invited seminar, University of Colorado Health Sciences Center Seminar Series, April 17th, 2000

90. "Predicting how Telecommunications Ads Affect Customer Values". INFORMS Spring 2000 Meeting, Salt Lake City, Utah, May 7-10, 2000. Salt Palace Convention Center. <http://www.informs.org/Conf/SaltLake2000//TALKS/MB19.html>
91. "A simulation model of excess illnesses from fluoroquinolone-resistant *Campylobacter*." Invited presentation, 9th Symposium of the International Society for Veterinary Epidemiology and Economics. Beaver Run Resort, Breckenridge, CO, August 6-11, 2000.
<http://www.cvmb.colostate.edu/cveadss/schedule/SchedulePage.htm>
92. "Some new problems in applied optimization: Telecommunications data mining and network design applications." Invited lecture, Seminar in Special Topics in Optimization, University of Colorado at Boulder, School of Business, November 2nd, 2000.
93. "Designing Effective Risk Management Decision Processes" (with V. Bier). Invited talk, INFORMS Annual Meeting, San Antonio, November, 2000. (Presented by Professor Bier.)
94. "A discrete-event simulation model of human health risks from fluoroquinolone-resistant *Campylobacter* in chickens." Society for Risk Analysis Annual Meeting, Washington D.C. December 6th, 2000.
95. "Alternatives to establishing thresholds: A predictive modeling framework." Invited talk presented at the FDA meeting on Use of Antimicrobial Drugs in Food Animal and the Establishment of Regulatory Thresholds on Antimicrobial Resistance. Rockville, MD, January 22 - 24, 2001.
<http://www.fda.gov/cvm/antimicrobial/thresagenda51.htm>
96. "Advances in data mining for predicting risks of customer responses to interventions." Invited lecture, Hearin Center for Enterprise Science. University of Mississippi School of Business Administration, Oxford, Mississippi, 2-24-01.
97. "Data mining methods for health risk data bases." Invited lecture, Seminar on Computational Biology, University of Colorado Department of Mathematics, Denver, Colorado, 3-15-01.
98. "Optimized mesh vs. ring comparisons". Invited presentation and panel discussion, All Optical Network Conference, Orlando, Florida, May 3rd, 2001.
99. "Campylobacter risk analysis: a cause-and-effect view." Invited presentation, *Second International Conference on Antimicrobial Resistance: Use of Antimicrobials and Protection of Public Health*. Office International des Epizooties, Paris, France. 2-4 October, 2001.

100. "Decision-making with incomplete models". Invited lecture, Seminar in Special Topics in Optimization, University of Colorado at Boulder, School of Business, November 28th, 2001.
101. "Game theoretic models of critical infrastructure protection" Society for Risk Analysis Annual Meeting, Seattle, WA, December 5th, 2001. (Bier, V., Abhichandani, V., Cox, L.A., Jr. Presented by Professor V. Bier.)
102. "The Causes of Campylobacteriosis". Invited paper presented at *Symposium on the Use of Fluoroquinolones in Poultry: Effect on Campylobacter and the Potential Human Health Consequences*. Cambridge, MA, March 1, 2002.
103. "Optimizing Dark Fiber Use in Metropolitan Areas" (with G. Bell), *Sixth INFORMS Telecommunications Conference*, Boca-Raton, Florida, March 10-13, 2002.
<http://www.informs.org/Conf/Telecom02/Abstracts/Cox01336062645.pdf>
104. "What is the cost of a DS3?" . Invited talk, *Sixth INFORMS Telecommunications Conference*, Boca-Raton, Florida, March 10-13, 2002.
http://www.informs.org/Conf/Telecom02/Abstracts/Cox_network_cost_abstract.pdf
105. "Least-Cost Acquisition of Service Facilities Via Spatial Clustering" (with D. Babayev), *Sixth INFORMS Telecommunications Conference*, Boca-Raton, Florida, March 10-13, 2002. <http://www.informs.org/Conf/Telecom02/Abstracts/Cox01356165150.pdf>
106. "Predicting Likely Telecom Service Buyers by Mining D&B and Billing Data", *Sixth INFORMS Telecommunications Conference*, Boca-Raton, Florida, March 10-13, 2002 <http://www.informs.org/Conf/Telecom02/Abstracts/Cox01361002535.pdf>
107. "How to Make Good Risk Management Decisions with Inadequate Data: Applications to Blood Supply Safety." Invited talk, *Decision-Making Under Conditions of Uncertainty Regarding Rare and Emerging Diseases, with special focus on the Human Impact of Transmissible Spongiform Encephalopathy (TSE)*, Fairmont Chateau Laurier Hotel. Ottawa, Ontario. March 25th and 26th, 2002.
http://www.hc-sc.gc.ca/pphb-dgspsp/hcai-iamss/sra-ser/tse-est02/pdf/proceedings_dmucu_%202002.pdf
108. "Using Epidemiological Data in Risk Assessment". Lecture in Professional Course on Probabilistic Risk Assessment. Health Canada. Ottawa, Ontario. March 27th, 2002.
109. "Integrating Health Risk Assessment and Management". Lecture in Professional Course on Probabilistic Risk Assessment. Health Canada. Ottawa, Ontario. March 27th, 2002.
110. "Causes of Campylobacteriosis", invited talk at the University of Colorado Health Sciences Center, Denver, Colorado. April 9th, 2002.

111. "Human Health Risk Assessment for Virginamycin Use in Chicken" (with D. Popken), Poster Presentation P11 at *2002 Conference on Antimicrobial Resistance*. Hyatt Regency Bethesda, Bethesda, MD, June 27th-29th, 2002.
<http://www.nfid.org/conferences/resistance02/absposter.pdf>
112. "Causes of Fluoroquinolone-Resistant Campylobacteriosis" (with D. Popken), Poster Presentation P12 at *2002 Conference on Antimicrobial Resistance*. Hyatt Regency Bethesda, Bethesda, MD, June 27th-29th, 2002.
<http://www.nfid.org/conferences/resistance02/absposter.pdf>
113. "Quantifying Human Health Impacts of Veterinary Medical Products Regulations." Invited Plenary Presentation. VICH 2. Tokyo, Japan, October 10th, 2002.
114. "Defending Networked Resources Against Intelligent Attacks." Invited presentation, INFORMS Annual Meeting, San Jose. November 17-20, 2002.
<http://informs.emeeetingsonline.com/emeetings/formbuilder/clustersessiondtl.asp?csno=311&mmnno=101>
115. "Modeling the Human Health Risks from Antibiotic Use in Chickens". Presented at INFORMS Annual Meeting, San Jose. November 17-20, 2002.
<http://informs.emeeetingsonline.com/emeetings/formbuilder/clusterpaperdisplay.asp?ppnno=1257>
116. "Quantifying human health impacts of antimicrobial risk management alternatives for enrofloxacin". Winner, Society for Risk Analysis Best Paper Award,. Society for Risk Analysis Annual Conference, New Orleans, LA. December 9-11, 2002.
www.sra.org/news0203.pdf
117. "Quantifying human health risks from virginiamycin used in chickens." Poster Presentation, Society for Risk Analysis Annual Conference, New Orleans, LA. December 9-11, 2002.
118. "Uncertainty in quantitative estimates of health risk from diesel particles". Invited plenary talk, Sixth Workshop on Mexico City Air Quality, Hotel Royal Pedregal, México January 21, 2003.
119. "Communicating risks and uncertainties to health managers." Invited talk, Advanced Risk Management Techniques, Strategies, and Modelling Practices: Blood Safety. Statistics and Risk Assessment Section, Blood Safety Surveillance and Health Care Acquired Infections Division. Centre for Infectious Disease Prevention and Control. Population and Public Health Branch. Health Canada. Fairmont Chateau Laurier Hotel. March 13th-14th, 2003.

120. "Nonlinear Low-dose Hematotoxicity" presented at *Non-Linear Dose-Response Relationships in Biology, Toxicology, and Medicine: An International Conference*. (University of Massachusetts, Amherst, MA, May 28-30th, 2003)
<http://www.belleonline.com/abstracts/session6.html>

Economic Analysis of Proposed Rule for Bovine Spongiform Encephalopathy: Minimal Risk Regions and Importation of Commodities
(APHIS Docket No. 03-080-1)

John J. VanSickle¹

Summary of Conclusions

USDA Animal and Plant Health Inspection Service has proposed a rule to amend regulations regarding the importation of animals and animal products to recognize a category of regions that present a minimal risk of introducing bovine spongiform encephalopathy (BSE) into the U.S. and proposed Canada be included in this category. The main commodities considered a threat to U.S. producers and consumers are slaughter cattle, feeder cattle and beef.

The USDA economic analysis of this proposed rule falls short of estimating the larger economic impacts this rule could have on the U.S. economy as it provides only a limited analysis of the effect of imports of Canadian cattle and beef on prices in the U.S.

The USDA analysis ignores the impacts this rule will have on associated industries and their productive output, and it ignores the impact it will have on employment. Our modeling, using Implan multipliers, suggests that a decline in \$1 of sales for the cattle ranching and farming sector will have a \$3.87 impact on total output in the economy. Accounting for the impacts on associated industries and employment indicates the potential impact on the U.S. economy from this proposed rule is:

- allowing feeder cattle imports from Canada would impact total economic output by \$701.5 million and cost the economy 7,883 jobs;
- allowing fed cattle imports from Canada would impact total economic output by \$1.7 billion and cost the economy 19,358 jobs;
- imports of beef resulting from this proposed rule would impact total economic output by \$5.8 billion and cost the economy 50,874 jobs and;
- loss of exports as a result of this rule would impact total economic output by \$16.1 billion and cost the economy 140,068 jobs.

The USDA analysis ignores the cost this rule would cause if a second BSE event occurred on U.S. soil due to the transmission, or market and consumer perception of transmission, resulting from this rule, or even the increased risk that producers and consumers would incur from trade with Canada when there is risk to introduction of BSE. A BSE outbreak would cause demand for beef to decline and an increase in human health concerns. Estimates of the cost of the 1986 outbreak on the British economy, with a herd size of 12.04 million head, are \$5.8 billion. Given that the United States herd size is eight times larger, a worst case scenario suggests the impacts on the U.S. could be as large as \$46.4 billion.

¹ Professor, Food & Resource Economics Department, University of Florida.

A BSE event in the U.S. is likely to cripple a weakened cattle and ranching industry with lower returns that would be difficult to recover.

Analysis

The U.S Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS) has proposed to amend the regulations regarding the importation of animals and animal products to recognize a category of regions that present a minimal risk of introducing bovine spongiform encephalopathy (BSE) into the United States via these products and proposed to include Canada into this category.² The category being proposed includes: (1) those regions in which a BSE-infected animal has been diagnosed, but in which measures have been taken that reduce the risk of BSE being introduced into the United States, and (2) those regions in which BSE has not been detected, but that cannot be considered BSE-free. The proposed rule lists Canada as the only minimal-risk region at this time. The minimal-risk region would not be limited to Canada, but others regions would have to be evaluated after requesting to receive this listing.

The commodities that would be allowed to enter under the proposed rule are:

- Cattle less than 30 months, sheep and goats less than 12 months, and cervids of any age, imported in all cases for immediate slaughter;
- Cattle sheep and goats imported for feeding at designated feedlots, and then slaughtered at less than 30 months of age for cattle and less than 12 months of age for sheep and goats;
- Meat from ruminants that have been slaughtered within these age restrictions;
- Meat of cervids either farm-raised or harvested on a game farm or similar facility;
- Meat from wild-harvested caribou, musk ox, or other cervids;
- Hunter-harvested wild ruminant products for personal use; and
- Certain other products and byproducts, namely, bovine livers and tongues, gelatin, tallow, and corvine offal.

APHIS later indicated that they would not require beef imported from BSE minimal-risk regions be derived from cattle less than 30 months of age.³ The main commodities to be considered of threat in trade with the United States are slaughter cattle, feeder cattle, and beef. The additional supplies this rule would allow into the United States are expected to cause prices to fall from an expansion in supply. Experience of BSE in the European Union indicates that major categories of costs from a BSE introduction include agriculture, food consumption, trade and tourism⁴. USDA recently concluded an economic evaluation that only considered the cost of increased supplies and their

² Bovine Spongiform Encephalopathy; Minimal Risk Regions and Importation of Commodities, 68 Fed Reg. at 62,386 (2004).

³ Bovine Spongiform Encephalopathy; Minimal Risk Regions and Importation of Commodities, 69 Fed Reg. at 10,635 (2004).

⁴ Kenneth Mathews, Jr. & Jean Buzby, *Dissecting the Challenges of Mad Cow & Foot-and-Mouth Disease*. (USDA Econ. Res. Serv., Agr. Outlook 4-5 (Aug. 2001).

economic impacts on the domestic market.⁵ As such, the USDA analysis ignores a large part of the potential impact that would occur if BSE were introduced in the U.S. herd, or if human health issues became a concern because of imported beef that was not properly identified. The United Kingdom Department of Environmental, Food and Rural Affairs estimates that the cost of BSE in the UK from an outbreak in 1996 totals more than \$5.8 billion today⁶. There have been 103 human deaths in the UK confirmed as definitely coming from vCJD and another 36 listed as probable from vCJD. There are another 7 definite/probable cases still alive.⁷ The impacts assessment also indicates that sales of beef declined 40 percent in the first year and that households cut their consumption 26 percent. The longer run consequences indicate that demand for beef and veal has declined 4.5 percent because of BSE.⁸ Clearly, the potential impacts of this rule go beyond the simple supply impact if BSE is introduced.

USDA APHIS estimated the economic impacts of resumed trade with Canada in these products and found that there would be a net economic benefit to the economy as increased imports would create greater benefits to consumers than harm to producers.⁹ They estimate net benefits of \$6.5 million from resumed trade in slaughter animals and \$6.1 million from resumed trade in feeder cattle. The benefits are even larger when trade in beef is allowed with benefits increasing to \$23.8 million if trade is reestablished for beef with bone and whole/half carcasses. Those benefits increase to \$106.5 million when all reestablished beef imports from Canada are assumed attributable to the rule, with beef values at \$3.50 per pound. Those welfare gains would be offset if the U.S. were to lose its export markets for beef with a net welfare loss of \$103.2 million if all countries other than Canada and Mexico would bar the import of U.S. cattle and beef.

On the surface, these results suggest there is little concern that resumed trade with Canada would have significant impacts on the U.S. market for beef, when in fact there are large consequences for the U.S. cattle industry. Consumers benefit from increased imports from Canada as prices fall and they pay less for the beef they consume. U.S. producers suffer from this scenario however, as producers suffer from lower prices that will force many to downsize or exit the beef production business. The results measure the impact this trade will have on producers' welfare but ignores the larger economic impact on employment and on associated industries. The results also ignore the increased risk that producers and consumers incur from trade with Canada when there is risk to introduction of BSE. The analysis performed by USDA APHIS focuses solely on the supply impacts that imports from Canada would have on U.S. producers and consumers, and on the impact that a loss in export markets could have on U.S. producers and consumers.

⁵ Economic Analysis Proposed Rule Bovine Spongiform Encephalopathy: Minimal Risk Regions and Import of Commodities (APHIS Docket No. 03-080-1), USDA Animal and Plant Health Inspection Service (Oct. 24, 2003).

⁶ *Id.*

⁷ CJD Statistics (<http://www.cjd.ed.ac.uk/figures.htm>).

⁸ Kenneth Mathews, Jr., Jason Bernstein, and Jean Buzby, INTERNATIONAL TRADE OF MEAT/POULTRY PRODUCTS AND FOOD SAFETY ISSUES, (USDA Econ. Res Serv., AER-828, 2003).

⁹ USDA, *supra* note 4.

The results of the USDA analysis merit a review. The analysis conducted by USDA was completed through 4 different scenarios. The first scenario assumed that imports of fed cattle would resume at 2002 levels of 840,800 head. The second scenario assumed that feeder cattle imports from Canada would resume with 504,500 head of feeder cattle (table 1). The results from these two scenarios indicate that when fed cattle imports are resumed producers' surplus declines by \$448 million. When feeder cattle imports are resumed, producers' surplus declines by \$182 million. USDA concludes that these impacts would be independent and that increased imports of feeder cattle would benefit feedlot owners. Lower prices for feeder cattle are more likely however, to pass through the market channel to consumers and feedlot producers are not likely to realize significant benefits from the lower prices for feeder cattle.¹⁰ This suggests that the impacts of these events would be additive, implying that opening the border to trade with Canada on fed cattle and feeder cattle would likely have an effect of more than \$630 million.

The third scenario (table 2) analyzed by USDA evaluated the impact of increased imports of beef products, one of beef cuts with bone and all whole and half carcasses (84,000 tons), and a second assuming that all imports of beef products are attributable to this rule (382,000 tons). The analyses were performed with 2 different baseline prices for beef, \$3.00 and \$3.50 per pound¹¹. The results of these analyses indicate that producers' surplus will decline by as much as \$337 million when beef with bone and whole and half carcasses are allowed entry (with beef prices of \$3.50 per pound). When entry of all beef is tied to the proposed rule, those impacts increase to \$1.5 billion. Again, these analyses are performed independently of considerations for imports of fed cattle and feeder cattle.

The final scenario (table 3) analyzed the impacts of losing exports to regions outside of Canada and Mexico as a result of the rule, one assuming 32 percent of all exports (half of all exports outside of Canada and Mexico) are redirected to the domestic market (263,360 tons) and a second assuming 64 percent of all exports (all exports outside of Canada and Mexico) are redirected to the domestic market (546,720 tons). The impacts of these scenarios indicate that producers' surplus will decline by \$1.1 billion when 32% of the export market is lost (with an assumed beef market of \$3.50 per pound) and \$2.2 billion when 64% of the export market is lost. This result will not happen unless trade in ruminant animals or ruminant animal products is allowed in the U.S. and our other trading partners feel that rule is too high a level of risk for continuing imports of beef from the United States.

¹⁰ Brett Debrucker. Telephone discussion on April 1, 2004, on how feeder cattle prices are set. Feeders typically estimate what fed cattle will sell for using the futures market and other sources. They then calculate feed and other input costs and deduct those from the fat cattle value. That value then represents an upper value on what they can pay for feeder cattle. The market uses cattle on feed reports and other sources to estimate the value of fed cattle in the future. If supplies of feeder cattle increase, the market will translate that into an increase in supply of fed cattle when those feeders are ready for market and expected fed cattle prices will decline, lowering the price for feeder cattle. Ultimately, it is the consumer who benefits from lower feeder cattle prices and feeders realize little to no benefit.

¹¹ It should be noted that these values for beef may be low. USDA Econ. Res. Serv. quotes beef prices at \$4.32 per pound in November, 2003, a record-high (<http://www.ers.usda.gov/news/BSECoverage.htm>).

It should be noted that these estimates are conservative in that they assume that the effects of this rule are only felt through trade impacts. There are other potential impacts that could be felt by U.S. producers. Clearly, if the U.S. were to lose export markets, it is also likely that U.S. consumers would lose some confidence in beef as a safe consumer product. The analysis conducted by USDA ignores the potential consequences of a U.S. animal being diagnosed with BSE as a result of introduction from Canada. The analysis also ignores the consequence of a potential human case of a variant of Creutzfeldt-Jakob Disease (vCJD). Clearly costs would rise significantly if either of these events would occur. A diagnosis of BSE in an animal of U.S. origin would likely cause concern with consumers and result in a decline in domestic demand for U.S. beef. The impact on the export market would depend on the nature of the event and on the response of the U.S. government. A diagnosis of vCJD could have even larger consequences. The UK experience suggests that following the 1996 outbreak in the UK, sales of UK beef fell 40% in the first year and household consumption in the UK fell 26%. The long run impact on shares of beef and veal in the UK diet were estimated to be a decline of 4.5%.¹² These results suggest that the risks are high for U.S. producers of beef. It has been estimated that the 1996 outbreak in the UK resulted in a \$5.8 billion impact on the UK economy. The 1996 herd size in the UK was 12.04 million head of cattle. This compares with the U.S. herd size of 96.1 million head in 2003.¹³ The U.S. herd size is 8 times larger than the UK herd when their BSE outbreak occurred in 1996. Using the 8 multiple on impacts that have been estimated for the UK indicates that impacts in the U.S. could be as large as \$46.4 billion if impacts are related to herd size.

The analysis performed by USDA did consider the impact on consumers through product availability and price, but it ignores the consequences of a change in industry output on the overall economy. Implan multipliers¹⁴ were used on the results presented in tables 1 through 3 to determine the overall economic impact of the proposed rule. The Implan data suggest that a decline in \$1 of sales for the cattle ranching and farming sector will have a \$3.87 impact on total output in the economy. Implan also provides an employment multiplier of 43.5 for this sector, indicating that every million dollars in sales of cattle or beef is associated with 43.5 jobs generated in the economy. Multipliers are also available for the meat processing sector. Implan indicates that the total economic output multiplier for the meat processing sector is 4.22, indicating that \$1 in sales of product from this sector creates \$4.22 in total economic impact. The employment multiplier for this sector indicates that each \$1 million in sales is associated with 36.6 jobs created.

The Implan multipliers were applied to the results derived by USDA by first identifying an impact from the lost sales that were attributable to quantity. Quantity impacts from each scenario were identified by multiplying the change in quantity supplied by U.S. producers by the baseline price used in the analysis. The quantity impact expected from allowing Canadian feeder cattle into the U.S. market as a result of this rule is \$181.2 million (table 4). Using the quantity impact and the multipliers from the Implan model, this decline in sales will result in total economic impacts of \$701.5 million and a loss of

¹² Mathews and Buzby, *supra* note 2 at 4.

¹³ FAOSTAT data, 2004.

¹⁴ MIG, Inc. *Implan Data for the United States* (2001).

7,883 jobs in the U.S. economy. Allowing fed cattle into the U.S. market as a result of the proposed rule results in quantity impacts of \$445 million as a result of the proposed rule, total economic impacts of \$1.722 billion and a loss of 19,358 jobs.

Using the same methodology for the proposed rule on beef yields similar results. If the proposed rule accounts only for the entry of increased imports of beef with bone and whole and half carcasses, then the U.S. domestic industry will realize a quantity impact valued at \$305.7 million. The total economic impact of this loss would be \$1.29 billion and a loss of 11,189 jobs. If all imports of beef from Canada are attributed to this rule then quantity impacts increase to \$1.390 billion and the total economic impact is \$5.868 billion from these lost sales with a loss of 50,874 jobs.

The expected impacts from losses in exports that result from the proposed rule can be calculated using the same methodology. If the U.S. loses 32 percent of the export market for beef, then quantity impacts from the proposed rule are \$1.843 billion, total economic impacts are \$7.781 billion and expected job losses amount to 67,472 jobs. If the U.S. loses 64% of the export market for beef as a result of the rule, then quantity impacts increase to \$3.827 billion and total economic impacts increase to \$16.154 billion and 140,068 jobs,

None of the above scenarios include producer losses associated with price declines for cattle and beef that continue to be marketed if the proposed rule is implemented. These price impacts can be calculated by multiplying the cattle and beef quantities that are expected to be marketed from U.S. sources after the proposed rule is implemented by the change in unit sales value computed by USDA in their analysis. The results of this analysis indicates that U.S. producers of feeder cattle would lose \$179.5 million on the feeder cattle they would continue to market as a result of the \$5.77 per head decline in price if the proposed rule was implemented. Fed cattle producers would lose \$437.7 million as a result of the lower prices (\$15.69) they would receive. U.S. producers would lose \$296.9 million in sales revenues from the price decline (1.3 cents per pound) if beef with bone and whole and half carcasses are attributed to the rule and that loss would increase to \$1.374 billion in price impacts (6.1 cents per pound) if all beef imported from Canada is attributed to the proposed rule. Price impacts from the loss of 32% of the export market are \$1.019 billion. These impacts increase to \$2.015 billion when 64% of the export market is lost.

The result of applying the proposed rule to fed cattle yields price impacts of \$437 million, quantity impacts of \$445 million, total economic output impacts on the economy of \$1.722 billion (which includes the quantity impact of \$445 million) and a job loss of 19,358. The expected result of applying the proposed rule to feeder cattle yields price impacts of \$179 million, quantity impacts of \$181 million, total economic output impacts of \$701 million and a loss of 7,883 jobs.

The cumulative loss of allowing the proposed rule to be implemented for feeder cattle and fed cattle is the sum of the impacts in each scenario, i.e., \$616 million in price impacts, \$626 million in lost sales due to fewer cattle being sold by U.S. producers, a

total economic output impact on the U.S. economy of \$2.423 billion and a loss of 27,241 jobs.

Implementing the proposed rule for beef separately without the feeder cattle and fed cattle would have the results previously presented. Implementing the beef portion of the proposed rule with the feeder cattle and fed cattle also included would have larger impacts than previously calculated for the cattle or beef, but it would not be additive as it was for feeder cattle and fed cattle. The cumulative scenarios were not computed by USDA. It has been argued that the impacts on feeder cattle and fed cattle are additive. It is expected that an analysis of the combined rule for feeder cattle, fed cattle and beef would likely be larger than that calculated for the cattle and beef, but not as large as the additive sum of the feeder cattle, fed cattle and the beef. The same would be expected for the loss of export markets. The impacts would not be additive, but would be greater than any individual impact.

The proposed rule will have serious effects on U.S. producers simply because of the additional product that will be sold in U.S. markets as a result of the rule. These results do not however measure the potential loss that would occur if a BSE event is documented on U.S. soil with a U.S. animal that affects U.S. demand for beef. Discovery of BSE in a U.S. animal is likely to have impacts several times larger than the impacts presented by USDA. The impacts in the UK have been estimated at \$5.8 billion with a herd one-eighth the size of the U.S. cattle herd. This proposed rule will weaken the U.S. domestic industry because of the lower returns that will result after the rule is implemented. A BSE event is likely to cripple a weakened cattle and ranching industry with a loss that would be difficult to recover.

Table 1. Impacts of resumed trade with Canada for fed cattle and feeder cattle.

SLAUGHTER CATTLE			
	<u>Baseline</u>	<u>Change</u>	<u>%Change</u>
Cattle Slaughter (head)	29,302,300	366,350	1.25%
S&H Price (\$/Head)	938	-15.64	-1.66%
S&H Price (\$/cwt)	78.16	-1.3	-1.66%
S&H US Supplied (head)	28461500	-474450	-1.67%
CD Imports (head)	0	840,800	
		<u>Change (\$million)</u>	
Producer Surplus		-\$448.7	
Consumer Surplus		\$455.3	
Net		\$6.5	
FEEDER CATTLE			
	<u>Baseline</u>	<u>Change</u>	<u>%Change</u>
Number fed	32,728,500	221,318	0.68%
Price (\$/head)	640	-5.77	-0.90%
Price (\$/cwt)	80	-0.72	-0.90%
US Supplied	31,407,600	-283,182	-0.90%
Canadian Imports (head)	0	504,500	
		<u>Change (\$million)</u>	
Producer Surplus		-\$182.0	
Consumer Surplus		\$188.2	
Net		\$6.1	

Source: USDA APHIS. Economic Analysis Proposed Rule Bovine Spongiform Encephalopathy: Minimal Risk Regions and Importation of Commodities (APHIS Docket No. 03-080-1). Oct. 24, 2003.

Table 2. Impacts of resumed trade with Canada for beef

INCREASED IMPORTS OF BEEF WITH BONE & WHOLE/HALF CARCASSES ONLY		P=3.00		P=3.50		P=3.00		P=3.50	
	<u>Baseline</u>	<u>Change</u>	<u>%Change</u>	<u>Change</u>	<u>%Change</u>	<u>Change</u>	<u>%Change</u>	<u>Change</u>	<u>%Change</u>
U.S. Consumption (tons)	12,453,000			40,324	0.32%	40,324	0.32%	40,324	0.32%
Price (cents/#)		-1.1		-1.3	-0.37%	-1.3	-0.37%	-1.3	-0.37%
US Supplied (tons)	11,465,000	-43,676		-43,676	-0.38%	-43,676	-0.38%	-43,676	-0.38%
Canadian Imports (tons)	0	84,000		84,000	0.67%	84,000	0.67%	84,000	0.67%
		<u>Change (\$ million)</u>		<u>Change (\$million)</u>		<u>Change (\$million)</u>		<u>Change (\$million)</u>	
Producer Surplus		-\$289.4		-\$337.6		-\$337.6		-\$337.6	
Consumer Surplus		\$313.2		\$365.4		\$365.4		\$365.4	
Net		\$23.8		\$27.8		\$27.8		\$27.8	
INCREASED IMPORTS OF ALL BEEF									
	<u>Baseline</u>								
U.S. Consumption (tons)	12,453,000			183,378	1.47%	183,378	1.47%	183,378	1.47%
Price (cents/#)		-5.2		-6.1	-1.73%	-6.1	-1.73%	-6.1	-1.74%
US Supplied (tons)	11,465,000	-198,622		-198,622	-1.73%	-198,622	-1.73%	-198,622	-1.73%
Canadian Imports (tons)	0	382,000		382,000	3.07%	382,000	3.07%	382,000	3.07%
		<u>Change (\$million)</u>		<u>Change (\$million)</u>		<u>Change (\$million)</u>		<u>Change (\$million)</u>	
Producer Surplus		-\$1,325.0		-\$1,545.8		-\$1,545.8		-\$1,545.8	
Consumer Surplus		\$1,416.4		\$1,652.3		\$1,652.3		\$1,652.3	
Net		\$91.3		\$106.5		\$106.5		\$106.5	

Source: USDA APHIS. Economic Analysis Proposed Rule Bovine Spongiform Encephalopathy: Minimal Risk Regions and Importation of Commodities (APHIS Docket No. 03-080-1). Oct. 24, 2003.

Table 3. Impacts of losses in exports to countries outside of Canada and Mexico.

32% LOSS OF EXPORTS

	<u>Baseline</u>	<u>P=3.00</u> Change	<u>P=3.50</u> Change	<u>P=3.00</u> %Change	<u>P=3.50</u> %Change
Export Loss					
US Consumption (tons)	11,465,000	116,483	116,483	1.02%	1.02%
US Production (tons)	12,288,000	-146,877	-146,877	-1.20%	-1.20%
Exports	907,133	-263,360	-263,360	-29.03%	-29.03%
Price(cents/#)		-3.6	-4.2	-1.20%	-1.20%
	<u>Change (\$million)</u>	<u>Change (\$million)</u>			
Producer Surplus	-\$965.6	-\$1,126.5			
Consumer Surplus	\$910.9	\$1,062.7			
Net	-\$54.6	-\$63.7			

64% LOSS OF EXPORTS

	<u>Baseline</u>	<u>P=3.00</u> Change	<u>P=3.50</u> Change	<u>P=3.00</u> %Change	<u>P=3.50</u> %Change
Export Loss					
US Consumption (tons)	11,465,000	232,967	232,967	2.03%	2.03%
US Production (tons)	12,288,000	-293,753	-293,753	-2.39%	-2.39%
Exports (tons)	907,133	-546,720	-546,720	-60.27%	-60.27%
Price(cents/#)		-7.2	-8.4	-2.40%	-2.40%
	<u>Change (\$million)</u>	<u>Change (\$million)</u>	<u>Change (\$million)</u>		
Producer Surplus	-\$1,919.6	-\$2,239.5			
Consumer Surplus	\$1,831.1	\$2,136.2			
Net	-\$88.4	-\$103.2			

Source: USDA APHIS. Economic Analysis Proposed Rule Bovine Spongiform Encephalopathy: Minimal Risk Regions and Importation of Commodities (APHIS Docket No. 03-080-1). Oct. 24, 2003.

Table 4. Economic impacts of the proposed rule on U.S. producers.
Total Impacts on Producers from Resumed Trade in:

	Price Impact (\$ million)	Quantity Impact (\$ million)	Economic Output (\$ million)	Employment Jobs
1. Feeder cattle	\$179.5	\$181.2	\$701.6	7,883
2. Fed cattle	\$437.7	\$445.0	\$1,722.7	19,358
3. Beef with bone	\$296.9	\$305.7	\$1,290.1	11,189
4. All beef	\$1,374.4	\$1,390.3	\$5,868.3	50,874
5. Loss of Exports 32%	\$1,019.8	\$1,843.5	\$7,781.0	67,472
6. Loss of Exports 64%	\$2,015.0	\$3,827.0	\$16,154.6	140,068

Note: These impacts ignore any potential impacts on domestic demand and tourism

JOHN J. VANSICKLE

Home address: 4216 NW 77th Terrace Gainesville, Florida 32606

Office address: P.O. Box 110240, University of Florida, Gainesville, Florida 32611-0240

Home Phone: (352) 373-1638

Office Phone: (352) 392-1881, ext. 221

Fax: (352) 392-9898

E-mail: SICKLE@UFL.EDU

BORN

Jefferson, Iowa. September 22, 1952. Raised on a family farm growing corn, soybeans, cattle and hogs. Graduated from Jefferson Community High School, 1970.

EDUCATION

Bachelor of Science, May 1974, Iowa State University

Major: Agricultural Business

Doctor of Philosophy, August 1980, Iowa State University

Major - Economics; Field - Marketing.

Dissertation: "The Development and Analysis of a Cooperative Decision Model for Product Pricing and Financial Structure."

EMPLOYMENT

University of Florida, Director, International Agricultural Trade and Policy Center,
1998-Present

University of Florida, Assistant, Associate and Full Professor, 1980-present

Iowa State University, Research Associate, 1976-80.

Consolidated Cooperative, Inc., Gowrie, IA, Feed Dept. Manager, 1975-76

Continental Grain, Allied Mills Feed Division, Janesville, Wisconsin, Quality Control Supervisor, 1974-75

PRESENT JOB DESCRIPTION

The primary responsibility of my current position is to develop extension education programs for and conduct applied research on the agricultural market. The emphasis of the position has been to develop tools that may be used by growers and growers' associations to assist them in their production, marketing and policy decisions. Educational programs include application of research results and economic analyses of international trade and market alternatives. A large amount of work has been completed in the area of international trade and its impact on U.S. growers. A second responsibility has been to develop extension education programs for and conduct applied research on commodity marketing using futures and options contracts.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

American Agricultural Economics Association. Member of Extension Committee, 1984-86, 1992-94. Chaired subcommittee for 1993 AAEA Annual meeting Pre-Conference, "Changing Dimensions for Extension Economists." Member of Awards Committee, 1994-96.

Florida State Horticultural Society.

Food Distribution Research Society, Secretary/Treasurer, 1985-87. Editorial Board, 1991-1998.

Southern Agricultural Economics Association. Member of Awards Committee, 1988-1994.

HONORS AND AWARDS

Honor Society of Phi Kappa Phi, 1979.

Cooperative League of the U.S.A. Graduate Research Award for cooperative research in a doctoral dissertation, 1980.

Included in Who's Who in the South and Southwest, Who's Who in Florida, Personalities of America, Men of Achievement, Who's Who of Emerging Leaders in America, Who's Who in Society, Who's Who in Science and Engineering.

The Honor Society of Agriculture, Gamma Sigma Delta, 1986.

Southern Agricultural Economics Association Distinguished Professional Contributions Award for Extension Education Programs, 1987.

American Agricultural Economics Association Award for Professional Excellence, Distinguished Extension Program - Individual, 1987.

Supervised M.S. thesis written by Abby Fromang that won the 1984 American Institute of Cooperation Award for most outstanding M.S. thesis written on the subject of cooperatives in 1983. Supervised the M.S. thesis written by German Molina that won the Food Distribution Research Society Award for Outstanding M.S. thesis in the area of food distribution, 1989. Supervised M.S. thesis written by Kenrick Jordan that was selected by the Food and Resource Economics Department for submission to the American Agricultural Economics Association for Outstanding M.S. thesis and was awarded Fred Prochaska Award for Outstanding M.S. thesis, 1992. Supervised M.S. thesis written by Joseph Ranney that was selected by the Food and Resource Economics Department for submission to the College of Agriculture for Outstanding M.S. thesis and was awarded Fred Prochaska Award for Outstanding M.S. thesis, 1993. Supervised M.S. thesis written by Napaporn Girapunthong that was selected by the Food and Resource Economics Department for submission to the College of Agriculture for Outstanding M.S. thesis and was awarded Fred Prochaska Award for Outstanding M.S. thesis, 2002.

Florida State Horticultural Society Award for Outstanding Paper in the Vegetable Section, 1993, for *Florida Mexico Competition in the Winter Fresh Vegetable Industry*.

American Society of Horticultural Science, Southern Region, Extension Publication Award, 1994; and the American Society for Horticultural Science Extension Educational Aids Award, 1995, for contribution to extension bulletin *Watermelon Production in Florida*.

1995 Florida Fruit and Vegetable Association Annual Research Award for vegetable marketing research.

Caribbean Forum Appreciation Award for outstanding contributions to the Caribbean student community, University of Florida, Food & Resource Economics Department, 1996.

U.S. Department of Agriculture Award for Superior Service for outstanding public service to the United States consumers and the vegetable industry by working with congressional leaders and the administration to achieve landmark trade agreements with Mexico, 1996.

American Society of Horticultural Science, Southern Region, Extension Publication Award, 1999 and 2000, for contribution to extension bulletin Vegetable Production Guide for Florida.

University of Florida Professional Excellence Program Award, 1998.

University of Florida Bank Award, 1999. Recognition and salary enhancement for continual scholarly activity. Selected as one of 125 faculty members out of 4,000 faculty to receive this award

U.S. Department of Agriculture Certificate of Appreciation, 2001. Certificate awarded for expertise and time committed to the Pesticide Impact Assessment Program's Citrus Assessment which resulted in the publication "Citrus Commodity: A Biologic and Economic Assessment of Pesticide Usage."

2002 Jim App Award for Outstanding Design Team. Award earned by the FL 107 Design Team, "Vegetable Production, Harvesting and Handling Efficiencies in Florida."

2002-03 Graduate Student Appreciation Award. Presented by the University of Florida Graduate Student Organization in the Food & Resource Economics Dept.

PUBLICATIONS

Refereed Publications:

- Adrian, J. L., J. E. Epperson and John J. VanSickle. "Improved Efficiency Through Electronic Marketing of Fresh Fruits and Vegetables." Food Distrib. Res Soc. J. 14(1983): 24-31.
- VanSickle, John J. and Guillermo E. Alvarado. "Florida Tomato Market Order Restrictions --An Analysis of Their Effects and Implementation." So. J. Agr. Econ. 15(1983): 109-114.
- VanSickle, John J. and George W. Ladd. "A Model of Cooperative Finance." Amer. J. Agr.Econ. 65(1983): 273-281.
- Epperson J. E., J. L. Adrian, and John J. VanSickle. "Cost Analysis of Computerized Marketing of Fresh Fruits and Vegetables." HortScience, 19(1984): 22-25.
- VanSickle, John J., J. L. Adrian, and J. E. Epperson. "Computerized Marketing for Fresh Produce--A Development for Today.: J. Food Distrib. Res. 16(1985): 38-56
- VanSickle, J.J. and G. W. Ladd. "A Model of Cooperative Finance: Reply." Amer. J. Agr. Econ. 68(1986): 173-76.
- VanSickle, John J., "The Development of Computer Aided Marketing in the Produce Industry." J. Food Distrib. Res. 17(1986): 57-67.
- VanSickle, John J., and Thomas J. Stevens. "Market Information Systems: An Online Agricultural Market News Retrieval System." So. J. Agr. Econ. 21(1989):195-201.
- VanSickle, John J. and Mario Castejon. "Economic Implications of a Change in the Size of Tomato Carton from 25-20 Pounds." Proc. Fla. St. Hort. Soc. 103(1990): 226-229.
- VanSickle, John J. and Daniel Cantliffe. "Florida Mexico Competition in the Winter Fresh Vegetable Industry." Proc. Fla. St. Hort. Soc. 105 (1992): 373-380.
- Srinarni, Endah, Richard Weldon, Charles B. Moss and John J. VanSickle. "Financial Appraisal of the Bank for Cooperatives." J. Agr. Coop. 9 (1994): 13-26.
- Jordan, Kenrick, and John J. VanSickle. "Integration and Behavior in the U.S. Winter Market for Fresh Tomatoes." J. Agr. and Applied Econ. 27 (1995): 127-37.
- Jordan, Kenrick and John J. VanSickle. "NAFTA and Florida Tomatoes: How Will Florida Growers Survive?" Proc. Fla. Hort. Soc. 108 (1995): 297-301.
- Deepak, M.S., T. H. Spreen and J.J. VanSickle. "An Analysis of the Impact of a Ban of Methyl Bromide on the U.S. Winter Fresh Vegetable Market." J. Agr. And Applied Econ. 28 (1996): 433-43.
- Muraro, R.P., W.F. Wardowski, W.M. Miller, J.J. VanSickle, and A. Heyman. "Measuring Efficiency in Florida Fresh Citrus Packinghouses, 1994-95." Pro. Fla. State Hort. Soc. 109 (1997): 282-84.
- VanSickle, John J. "A Compromise in the Winter Fresh Tomato Dispute." Flor. J. International Law 45 (1998)

- Gordon, Michael W., Eric Salonen, Stephen J. Powell, Patrick J. Macrory, David Hurtado Badiola and John VanSickle. "Agricultural Disputes: Mexico Tomatoes to Florida and Washington Apples to Mexico." United States-Mexico Law Journal 6 (1998): 117-46.
- Evans, Edward , NaLampang, Sikavas , VanSickle, John J.. "Near Term Prospects for the U.S. Sugar Industry". *International Sugar Journal* 104 (2002): 68-81.
- Cantliffe, Daniel J., VanSickle, John J. "Competitiveness of the Spanish and Dutch Greenhouse Industries with the Florida Fresh Vegetable Industry." *Proc. Fla. State Hort. Soc.* 114 (2002). : 283 -287
- VanSickle, John J., Edward A. Evans, and Robert D. Emerson. "U.S.-Canadian Trade Wars: An Economist Tries to Make Sense Out of Recent Antidumping Suits." *J. Agric. & Appl. Economics* 35,2 (August 2003): 283-296.
- Girapunthong, Napaporn , VanSickle, John J., Renwick, Alan . "Pricing Asymmetry in the U.S. Fresh Tomato Market." *Food Distribution Research Journal*. 2003. In Review

Book Review:

"Marketing Fresh Fruits and Vegetables." by R. Brian Howe. Amer. J. Agr. Econ. 74 (May 1992): 510-11.

Non-Refereed Publications 1986-Present:

- Buckley, Katherine C., John J. VanSickle, Maury E. Bredahl, Emil Belibasis, and Nicholas Gutierrez. "Florida and Mexico Competition for the Winter Fresh Vegetable Market." Washington, DC, USDA ERS AER-556, June 1986.
- VanSickle, John J., and Emil Belibasis. "Demonstration Program Manual for a Computer Aided Marketing System." Food and Resource Econ. Dept., Unnumbered Staff Paper, University of Florida, October 1986.
- VanSickle, John J. "Vegetables." Outlook 1987. FRE 63, Fla. Coop. Ext. Serv., Gainesville, 1986: p. 2.
- Belibasis, Emil, and John J. VanSickle. "Assessing Foreign Competition in the Winter Fresh Tomato Industry." Paper Presented at the SAEA 1986 annual meetings. February 1986.
- Belibasis, Emil, and John J. VanSickle. "Assessing Foreign Competition in the Winter Fresh Tomato Industry." Abstract. So. J. Agr. Econ. 18(1986): 183.
- VanSickle, John J. "The Development of Computer Aided Marketing in the Produce Industry." Paper presented at the SAEA 1986 annual meetings. February 1986.
- VanSickle, John J. "The Development of Computer Aided Marketing in the Produce Industry." Abstract. So. J. Agr. Econ. 18(1986): 194-95.
- VanSickle, John J., and Thomas J. Stevens. "Market Information Systems for the IFAS VAX Computer Network--Users Manual and Help Guide." Fla. Ext. Circ 764, University of Florida, May 1987.
- Belibasis, E., T. Stevens, and J. VanSickle. "Fresh Vegetable Budget Generator--VEG-BUD." Fla. Coop. Ext. Circ. 739, University of Florida, February 1987.
- VanSickle, John J. "Impact of Shelf Space Characteristics on Consumers' Produce Buying Decisions." Abstract. J. Food Distrib. Res. 18(1987): 133-34.

- VanSickle, John J. "The Competitive Position of Southern U.S. Produced Fresh Fruits and Vegetables in a World Economy." Proceedings of The Competitive Position of Southern Agriculture in a World Economy - A Regional Trade Conference. (May 1987): 121.
- VanSickle, John J., and Thomas J. Stevens and Emil Belibasis. "Computer Feasibility of Market News Information - Phase 1A. A Present System Description Analysis." Unnumbered Staff Paper Submitted to USDA AMS. FRED-IFAS. May 1987.
- VanSickle, John J., and Thomas J. Stevens. "Computer Feasibility of Market News Information Phases 1B and 1C. Objectives and Requirements for an AMS Market News Information System." Unnumbered Staff Paper Submitted to USDA AMS. FRED-IFAS. July 1987.
- VanSickle, John J., and Thomas J. Stevens. "Computer Feasibility of Market News Information Phase II. Alternative Systems Analysis." Unnumbered Staff Paper Submitted to USDA AMS. FRED-IFAS. December 1987.
- VanSickle, John J., and German Molina. "Supermarket Produce Demand and Shelf Space Effects-Executive Summary." Unnumbered Staff Paper. FRED-IFAS. August 1987.
- VanSickle, John J. "Lessons Learned from Restricting Sales of Low Quality Tomatoes." 1987 Florida Tomato Institute. Veg. Crops Ext. Rep. VEC 87-3. (September 1987): 56.
- VanSickle, John J., and Thomas J. Stevens. "The Role of Information in Agricultural Marketing." Marketing Florida Food and Agricultural Products: A Statewide Conference. (September 1987): 86-92.
- VanSickle, John J. "Computer Aided Marketing." Texas Pecan Growers Association Combined Proceedings of the 65th & 66th Annual TPGA Conference, 64(1988): 24-26.
- VanSickle, John J. "The Price is Right." Proceedings 1988 Annual Meeting of North American Strawberry Growers Association. (February 1988): 62-7.
- Molina, German and John J. VanSickle. "Supermarket Produce Demand and Shelf Space Effects." Jour. Food Dist. Res. 19(1988): 124-25.
- VanSickle, John J. "Vegetables Outlook." Outlook 1989. Fla. FRE 80 (Nov.-Dec., 1988): 2.
- VanSickle, John J. and Thomas J. Stevens "Computers in Agriculture." Proceedings of the Intramerican Cattlemen Confederation. June 1989.
- VanSickle, John J. and Thomas J. Stevens "Electronic Marketing of Peaches." Proceedings 1988 Annual Meeting National Peach Council. (February 1989): 24-29.
- VanSickle, John J. "Comments About USDA Data Dissemination." Summary of 1989 USDA Data Users Meetings. USDA, (1989): 14-17.
- VanSickle, John J. "Import Issues for Florida Agriculture." Citrus and Vegetable Magazine, 1989.
- VanSickle, John J. and T. J. Stevens. "Market Information Systems (MIS): An On-Line Agricultural Market News Retrieval System for IFAS Faculty." Abstract, Florida Associations of Extension Professionals. (1989): 21.
- VanSickle, John J. "Vegetables". Outlook 1990. Fla. FRE 91 (Nov.-Dec. 1989): 2.
- Stevens, Tom and John VanSickle. "Using Fruit and Vegetable Price Data". Market Information Systems Newsletter. No.1, Fla. Coop. Ext. Serv., Gainesville, (Aug. 11, 1989): 2-4.

- Stevens, Tom and John J. VanSickle. "Procomm Timed Execution Facility and Command Files." Market Information Systems Newsletter. No. 1, Fla. Coop. Ext. Serv., Gainesville, (Aug, 11, 1989): 4-5.
- VanSickle, John J. and Stevens, Thomas J. "Market Information Systems for the IFAS Computer Network. User Manual and Help Guide: Version 2." Fla. Coop. Ext. Cir. 839, University of Florida, May 1989.
- VanSickle, John J. "Import Competition in the Winter Fresh Vegetable Industry". Vegetable and Specialties Situation and Outlook Report. USDA Econ. Res. Serv. TVS-247. (March 1989): 19-24.
- Brittian, Susan L. and John J. VanSickle. "Marketing Fresh Fruits and Vegetables in Regional and National Markets: How to Find and Evaluate a Produce Dealer." FRE Ext. Note EN-8. University of Florida. Jan. 1989.
- Brittian, Susan L. and John J. VanSickle. "Marketing Strategies for Fresh Produce Growers." FRE Ext. Note EN-9. University of Florida. Jan. 1989.
- Brittian, Susan L. and John J. VanSickle. "Marketing Fresh Fruits and Vegetables." Citrus and Vegetable Magazine, Feb., 1989:36, 46-49. (also published as "Marketing Fresh Fruits and Vegetables in Regional and National Markets: How to Find and Evaluate a Produce Dealer." FRE Ext. Note EN-8. University of Florida. Jan. 1989.)
- Brittian, Susan L. and John J. VanSickle. "Marketing Strategies for Fresh Produce Growers." Citrus and Vegetable Magazine. (March 1989): 16-30. (also published as "Marketing Strategies for Fresh Produce Growers." FRE Ext. Note EN-9. University of Florida. Jan. 1989.)
- VanSickle, John J. and German Molina. "The Effects of Merchandising on Supermarket Produce Demand." Selected pap. presented at the So. Agr. Econ. Assoc. annual meetings, Knoxville, Tenn. Feb. 8, 1989.
- VanSickle, John J. and German Molina. "The Effects of Merchandising on Supermarket Produce Demand." Abstract. So. J. Agr. Econ. 21 (1989): 192.
- VanSickle, John J. "An Overview of Florida Agricultural Import Issues." Paper presented at the International Trade Conference in Orlando, Florida, Feb. 23, 1989.
- VanSickle, John J. "Trends in Florida Fresh Vegetables." Paper presented at the Farm Managers and Rural Appraisers annual meeting, Orlando, Florida, May 25, 1989.
- VanSickle, John J. "Import Competition In the Winter Fresh Vegetable Industry: A 1989-90 Update." Citrus and Vegetable Magazine, (February 1990): 85-96.
- VanSickle, John J. "CBI has Minimal Effect on Florida Farmers." Florida Agriculture. May 1990.
- VanSickle, John J. "Analysis of Agribusiness Firm Level Assistance in the Horticulture Industry - Kenya: Assessments and Recommendations." October 1990.
- VanSickle, John J. "Marketing Florida Watermelons." Watermelon Production Guide for Florida. SSVEC-51 Vegetable Crops Dept., IFAS (1990): 53-56.
- VanSickle, John J. "International Marketing Issues." Madagascar Training Manual. November 1990.
- VanSickle, John J. "Comment on Florida Tomato Committee Proposal for Eliminating Low Grade Tomatoes When and If the Parity Price Reached a Certain Level." Prepared for USDA Hearings on Florida Tomato Committee Proposal. November 1990.
- VanSickle, John J. Market Information Systems Newsletter. FRED, IFAS. No. 2. November 1990.

- VanSickle, John J. "Vegetables" Outlook 1991. Fla. FRE 91. (Nov.-Dec. 1990): 2.
- Holt, John, Bob Degner, John VanSickle, Gary Fairchild and Rod Clouser. "Checklists for Getting Started in Agriculture". Food and Resource Economics Extension Notes EN-24. May, 1991.
- Messina, William A., John J. VanSickle and Rodney L. Clouser. "Florida Agriculture and Global Markets." Navigate. FRED Newsletter. (Summer, 1991): 1-4.
- Scott, Samuel E., John J. VanSickle, James L. Seale, Jr. and Richard Kilmer. "Demand for Winter Fresh Vegetables in the United States Market - An Application of the Inverse (Rotterdam) Model." Working paper. December, 1991.
- Taylor, Timothy G. and John VanSickle. "Vegetables." U.S.- Mexico Free Trade and Florida Agriculture. FRED Staff Paper SP-91-21. (May 1991): 12-16.
- VanSickle, John J. "Voice Messaging System for Market News - Final Report." June 1991.
- VanSickle, John J. "Market and Price Information Systems Analysis for the AAP's Information Center." Report Submitted to US AID. June, 1991.
- VanSickle, John J. "Agents Cooperative Exchange, Inc. - Agent Interest Survey Results." Report submitted to Agents Cooperative Exchange. August, 1991.
- VanSickle, John J. "Vegetables". Outlook 1992. Fla. FRE. (Nov. - Dec. 1991): 2.
- VanSickle, John J. "Market News". Outlook 1992. Fla. FRE. (Nov. - Dec. 1991): 6.
- VanSickle, John J. Market Information Systems Newsletter. No. 3. March 1991.
- VanSickle, John J. Market Information Systems Newsletter. No. 4. May 1991.
- VanSickle, John J. Market Information Systems Newsletter. No. 5. Oct. 1991.
- VanSickle, John J. and Samuel Scott. "Potential Impacts on the Florida Tomato Industry from U.S. Mexico Free Trade." Proceedings Florida Tomato Institute 1991. (Sept. 1991): 104-126.
- VanSickle, John J. and Bill Carter. "Hungarian Agricultural Marketing and Trade Informational Sources." Report submitted to US AID. December 1991.
- VanSickle, John J. and Samuel Scott. "Impacts of North American Free Trade Agreement (NAFTA) on the Winter Vegetable Industry - A Market Share Analysis." Working paper. December, 1991.
- Jordan, Kenrick and John VanSickle. "Market Integration in the U.S. Winter Market for Fresh Tomatoes." Selected paper presented at the AAEA annual meetings, August, 1992.
- Jordan, Kenrick and John VanSickle. "Market Integration in the U.S. Winter Market for Fresh Tomatoes." Abstract. AJAE 74 (December 1992): 1292.
- VanSickle, John J. "Marketing Florida Watermelons." Watermelon Production Guide for Florida. Don Maynard, Ed. Ext. Bull. SP, Univ. of FL. (May 1992): 49-52.
- VanSickle, John J., Daniel Cantliffe, Emil Belibasis, Gary Thompson and Norm Oebker. "Competition with Mexico and the Potential Impact from Free Trade." Proc. Florida Tomato Institute Veg. Crops SS HOS 1. Univ. of FL. (Sept 1992): 2-40.
- VanSickle, John J. "Vegetables." Outlook 1993. Fla. FRE Newsletter (Nov. - Dec. 1992): 2.

- VanSickle, John J. "Market News." Outlook 1993. Fla. FRE Newsletter (Nov.-Dec. 1992): 6.
- VanSickle, John J. and William Messina, Jr. "Cuba's Vegetable Industry". International Working Paper Series. IW93-3. Feb. 1993.
- Rathwell, P.J. and John J. VanSickle. "World Trade in Fresh Fruit and Vegetables." Southern Agriculture in a World Economy. SRDC No. 148, Leaflet 14. February 10, 1994.
- VanSickle, John J., Emil Belibasis, Dan Cantliffe, Gary Thompson and Norm Oebker. "Competition in the U.S. Winter Fresh Vegetable Industry." USDA ERS Agr. Econ. Rep. 691. July 1994.
- VanSickle, John J., "1994 Vegetable Outlook." Citrus and Vegetable Magazine 57 (Feb. 1994): 12-13.
- VanSickle, John J., and T. Song. "Voice Market Information System for Agricultural Market News." Computers in Agriculture 1994: Proceedings of the 5th International Congress. (1994): 622-7.
- VanSickle, John J. "FCOJ Futures Markets: Possible Uses in the Florida Citrus Industry." Unnumbered staff paper presented at In-Service Training Session, Lake Alfred, Flor. Feb. 1994.
- VanSickle, John J., Kamal Dow and Anne Moseley. "Cuba Trip Report." Unnumbered staff paper documenting visit to vegetable growing regions in Cuba. July, 1994.
- VanSickle, John J. "Analysis of a Proposed Change to 10 Kilogram Cartons for the Florida Tomato Industry." Unnumbered staff paper presented to the Florida Tomato Committee. Sept. 1994.
- VanSickle, John J., and Tim Hewitt. "Issues in the Horticultural Industry." Paper presented at the Southern Outlook Meetings, Atlanta, Georgia. Sept. 1994.
- Ranney, Joseph, and John J. VanSickle. "Pricing Efficiency of Options on FCOJ Futures Contracts." Unnumbered Staff Paper. 1994.
- VanSickle, John J. "Hedging Citrus Using Futures Markets." Unnumbered staff paper presented to Fall Citrus Seminar, Tavares, Flor. Oct. 1994.
- VanSickle, John J. "FINAL REPORT: Voice Market Information System for AMS Field Offices." Submitted to USDA AMS. Nov. 1994.
- VanSickle, John J., and Thomas H. Spreen. "Florida without Methyl Bromide." Citrus and Vegetable Magazine 58 (Nov. 1994): 26-8.
- VanSickle, J.J., T.H. Spreen and A.E. Moseley. "An Economic Analysis of a Ban On Methyl Bromide on the Florida Tomato Industry." 1994 Proc. Florida Tomato Institute PRO105 (Sept. 1994): 17-38.
- Deepak, M.S., Thomas H. Spreen and John J. VanSickle, "An Analysis of a Ban on Methyl Bromide on the U.S. Winter Fresh Vegetable Market." Selected Paper presented at the 1995 SAEA meetings, New Orleans, Louisiana. 1994.
- VanSickle, John J. "Marketing Strategies for Fresh Produce Growers." Vegetable Production Guide for Florida. Univ. FL Ext. Bull. SP170. (1995): 98-102.
- VanSickle, John J. "Vegetables." Outlook 1995. Fla. FRE 121 (Dec. 1994): 2.
- VanSickle, John J. "Market News." Outlook 1995. Fla. FRE 121 (Dec. 1994): 6.

- Deepak, M.S., Thomas H. Spreen and John J. VanSickle, "An Analysis of a Ban on Methyl Bromide on the U.S. Winter Fresh Vegetable Market." Abstract. J. Agr. and Applied Econ. 27 (July 1995): 312.
- VanSickle, John J. "1995 Florida Vegetable Outlook." Citrus and Vegetable Magazine. Feb. 1995: 25.
- VanSickle, John J. "A Discussion About Tomato Shipments and Prices and NAFTA Tariff Rate Quotas." Exhibit 3. Petition for Relief from Imports of Fresh Winter Tomatoes. Florida Tomato Exchange. March 29, 1995.
- Spreen, Thomas H., John J. VanSickle, Anne Moseley, M.S. Deepak, William Messina and Lorne Mathers. "An Assessment of the Long Term Economic Impacts of the Loss of Methyl Bromide on Florida." IFAS Research Bulletin 898. 1995.
- VanSickle, John J. "Marketing Produce in North America." Paper presented at the Opening Session of the Harvest and Postharvest Technologies Conference, Co-Sponsored by Am. Soc. Agr. Eng. And Mex. Assoc. Of Agr. Eng. February 20-24, 1995.
- Jordan, Kenrick, and John J. VanSickle. "NAFTA and Florida Tomatoes: How Will Florida Growers Survive?" Pro. Flor. State Hort. Soc. 108 (1995): 297-301.
- VanSickle, J.J. "The Situation and Competition Between Florida and Mexico: The Rules of the Game are Changing." 1995 Proc. Florida Tomato Inst. PRO 512. (Sept. 1995): 7-18.
- VanSickle, John J. "The Situation and Competition Between Florida and Mexico: The Rules of the Game Are Changing. Part I." Citrus & Vegetable Mag. (Oct. 1995): 60-63. (revision of paper presented at the 1995 Florida Tomato Institute).
- VanSickle, John J. "The Situation and Competition Between Florida and Mexico: The Rules of the Game Are Changing. Part II." Citrus & Vegetable Mag. (Nov. 1995): 36-41. (revision of paper presented at the 1995 Florida Tomato Institute).
- VanSickle, John J. "Marketing Strategies for Vegetable Growers." Vegetable Production Guide for Florida. Bull. SP 170. (Don Maynard and George Hochmuth, eds.) 1995: 98-102.
- VanSickle, John, Steve Sargent, Bill Walker, Ted Tucker, Janet Harding and Richard Jones. "Vine Ripes, Post Harvest & Marketing." Workshop on Tomato Production and Marketing in Dade County. (Aug, 22, 1995): 7.
- VanSickle, John J. "Market News." Outlook 1995. Fla. FRE Newsletter. Dec. 1996.
- VanSickle, John J. "Vegetables." Outlook 1996. Fla. FRE Newsletter. Dec. 1995.
- VanSickle, John J. "1996 Florida Vegetable Outlook." Citrus and Vegetable Mag. (Jan. 1996): 42-43.
- VanSickle, John J. "Enforcement of Regulations Under Trade Agreements: Impacts on Competitiveness." Global Restructuring of Agro-Food Markets: Need for Change in Marketing Policy. Food and Agricultural Marketing Consortium FAMC 96-1. 1996: 83-95.
- Moseley, Anne E., Armando Nova Gonzalez, Maria Antonia Fernandez Mayo, John VanSickle, Carlos E. Juaregui and Douglas E. Smith. "The Vegetable and Tropical Fruit Industries in Cuba and Florida." Univ. FL Int. Agr. Trade & Dev. Ctr. IW96-7. April, 1996.
- VanSickle, John J., Harold B. Clark and Steve Sargent. "An Evaluation of the Provisions and Programs of the Florida Tomato Committee." Final Report. 1996.

- VanSickle, John J. "Competition in the U.S. Domestic Market Between U.S. and Mexican Growers of Fresh Tomatoes and Bell Peppers." Paper written and submitted by petitioners as part of the Section 201 case taken to U.S. International Trade Commission, May, 1996.
- VanSickle, John J. and Kenrick Jordan. "Exchange Rates and Competitiveness - Mexico is Gaining Comparative Advantage from Competitive Devaluation of the Peso." Food & Resource Economics Department Extension Note EN-36. Sept. 20, 1996.
- VanSickle, John J. "Economic Perspectives on Alternative Floor Price Approaches." Paper written at request of Senator Bob Graham (D-FL) to provide information during negotiation of the suspension agreement in the antidumping case before the U.S. Dept. Commerce. 1996.
- Byrne, Patrick J., John J. VanSickle and Monica Escaleras. "Performance of Fruit and Vegetable Marketing Cooperatives." Final Project Report to U.S.D.A. Sept. 1996.
- VanSickle, John J. "Florida Tomatoes in a Global Market." 1996 Proceedings of the Florida Tomato Institute PRO 108. 1996: 1-6. Also published in FL Agr. Con. & Trade Show. Veg. Crops Proc. PRO 513. Oct. 1996: 21-2.
- VanSickle, John J. "The Economic Impact of Florida's Loss of Fresh Vegetable Production, 1992-95." Paper written at request of Florida Agricultural Commissioner Bob Crawford to assess the loss of vegetable production in Florida. 1996.
- VanSickle, John J. "Monitoring Competition and Examining the Role of the Florida Winter Fresh Tomato Industry in the U.S. Market." Report of Tomato Research Supported by the Florida Tomato Committee 1995-96. University of Florida. 1996. 67-70.
- VanSickle, John J., Thomas H. Spreen and Kenrick Jordan. "An Economic Analysis of the Impact of Devaluation of the Peso and Adverse Weather in Florida on the North American Winter Fresh Vegetable Market." Paper presented at the Tri-National Research Symposium NAFTA and Agriculture: Is the Experiment Working? Nov. 2, 1996.
- VanSickle, John J. "Horticulture – GATT, NAFTA and Trade Policy." Paper presented at the Southern Regional Outlook Conference, Atlanta, GA. Nov. 11, 1996.
- VanSickle, John J. "Compromise in Fresh Tomato Trade Dispute a Win for All Parties." Working paper presented at Sandoz Seed Company Annual Research Conference. December 6, 1996.
- Muraro, R.P., W.F. Wardowski, W.M. Miller, J. J. VanSickle and A. Heyman. "Measuring Efficiency in Florida Fresh Citrus Packinghouses, 1994-95." Pro. Flor. State Hort. Soc. 109 (1996): 282-84.
- VanSickle, John J. "Vegetables." Outlook 1997. Fla. FRE Newsletter. Dec. 1996: 2.
- VanSickle, John J. "Market News." Outlook 1997. Fla. FRE Newsletter. Dec. 1996: 6.
- Muraro, R.P., J.J. VanSickle, A. Heyman, W.F. Wardowski and W.M. Miller. "Factors Affecting Efficiency in Florida Fresh Citrus Packinghouses, 1994-95." Univ. Fla. Food & Res. Econ. Dept. Staff Paper SP 97-1. Jan. 1997.
- VanSickle, John J. "1997 Florida Vegetable Outlook." Citrus & Vegetable Mag. 61 Jan. 1997: 22-3.
- VanSickle, John, and Sara Medina. "Final Report – Phase I: An Economic Analysis of Best Management Practices (BMPs) for Potatoes Grown in the Tri-County Area of North Florida." Final Report submitted to St. Johns River Water Management Dist. January, 1997.

- The Methyl Bromide Task Force of the UNEP Economic Options Committee. "An Assessment of the Economic Viability of Alternatives to Methyl Bromide." United Nations Environmental Programme UNEP Technology and Economic Assess Panel Report. Feb., 1997.
- VanSickle, John J., and Sara Medina. "Economics – The Bottom Line of a Sound, Successful Nutrient Management Program." Proc. Of Flor. Fertilizer and Liming Conference. May, 1997: 23-24.
- Deepak, M.S. T.H. Spreen and J.J. VanSickle. "Environmental Externalities and International Trade: The Case of Methyl Bromide." Paper presented at Conference on Flexible Incentives for the Adoption of Environmental Technologies in Agriculture, Gainesville, Florida, June 8, 1997.
- VanSickle, John J., and Charles Douglas. "Monitoring Competition in the Winter Fresh Tomato Market." Flor. Food & Res. Econ. Ext. Note EN-37. Sept. 3, 1997.
- VanSickle, John J. "Citrus Marketing and Management Strategies: Using the Futures Market and Options in Risk Management for FCOJ." Flor. Agr. Conf. & Trade Show Citrus & Veg. Proc. PRO 109 (1997): 8-10.
- VanSickle, John J. "Developing Opportunities for Florida Vegetable Growers." Proc. of South Florida Vegetable Growers Workshop, Homestead, FL. Nov. 1997.
- VanSickle, John J. "Vegetables." Outlook 1998. Fla. FRE Newsletter. Dec. 1997: 2.
- VanSickle, John J. "Market News." Outlook 1998. Fla. FRE Newsletter. Dec. 1997: 7.
- VanSickle, John. "Citrus Section: Marketing and Management Strategies." Citrus & Vegetable Mag. 62 Dec. 1997: 40.
- VanSickle, John J., and Sara Medina. "BMPs Will Benefit Growers." Tri-County Crop Talk. Spring/Summer 1998: 1,3.
- VanSickle, John J. "1998 Florida Vegetable Outlook." Citrus & Vegetable Mag. 63 Jan. 1998: 34-35.
- VanSickle, John. "Citrus Section: Marketing and Management Strategies." Citrus & Vegetable Mag. 63 Jan. 1998: 51.
- VanSickle, John J. "1998 Florida Vegetable Outlook." American Vegetable Grower Mag. Jan. 1998: 20-21.
- VanSickle, John. "Citrus Section: Marketing and Management Strategies." Citrus & Vegetable Mag. 63 (Feb. 1998): 52.
- VanSickle, John. "Citrus Section: Marketing and Management Strategies." Citrus & Vegetable Mag. 63 (Mar. 1998): 44.
- VanSickle, John. "Citrus Section: Marketing and Management Strategies." Citrus & Vegetable Mag. 63 (April 1998): 37.
- VanSickle, John. "Citrus Section: Citrus Marketing and Management Strategies." Citrus & Vegetable Mag. 63 (May 1998): 37.
- VanSickle, John. "Citrus Section: Fencing the Market for FCOJ." Citrus & Vegetable Mag. 63 (Sept. 1998): 46.
- VanSickle, John J. "Citrus Section: Schedule Routine Marketing Check-ups." Citrus & Vegetable Mag. 63 (Oct. 1998): 49.
- VanSickle, John J. "Citrus Section: Citrus Marketing and Management Strategies." Citrus & Vegetable Mag. 63 (Nov. 1998): 44-45.

- VanSickle, John J. "Citrus Section: Marketing Strategies." *Citrus & Vegetable Mag.* 63 (Dec. 1998): 33-34.
- VanSickle, John J. and Sara Medina. "BMPs Benefit Growers and the River." Tri-County Crop Talk (Spring/Summer 1998): 3-4.
- VanSickle, John J. "1998 Vegetable Outlook." *American Vegetable Grower Mag.* (Jan. 1998): 20-21.
- Muraro, Ronald P., John J. VanSickle, W.F. Wardowski and William M. Miller. "Factors Affecting the Efficiency in Florida Fresh Citrus Packinghouses, 1995-96. Univ. FL Econ. Info. Rep. 98-1 (April 1998).
- VanSickle, John J. "Marketing Strategies for Vegetable Growers." Vegetable Production Guide for Florida. (1998): 91-94. (Also made available as an individual publication, Univ. FL FRE 144)
- VanSickle, John J. "Vegetables." *Outlook 1999*. FRE No. 142. (Nov.-Dec. 1998): 2.
- VanSickle, John J. "Implementation: Policy Regimes for ODS Phaseouts." *1998 Assessment Report of the UNEP TEAP Economic Options Committee*. United Nations Environment Programme. (1998): 15-19.
- VanSickle, John J. "Update on Economic Aspects of Selected Controlled Substances: Methyl Bromide." *1998 Assessment Report of the UNEP TEAP Economic Options Committee*. United Nations Environment Programme. (1998): 101-107.
- VanSickle, John J. "International Trade Issues: WTO Issues." *1998 Assessment Report of the UNEP TEAP Economic Options Committee*. United Nations Environment Programme. (1998): 133-134.
- VanSickle, John J. "The Free Trade Area of the Americas: Current Status and Future Opportunities for Florida Tomato Growers." *VEG PRO Pro. Florida Tomato Institute* (Sept. 1998): 1-14.
- VanSickle, John J., and Charlene Brewster. "The Impact of the Methyl Bromide Ban on the U.S. Vegetable Industry." *1998 Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions*. (Dec. 1998): 38-1 to 38-2.
- VanSickle, John. "The Free Trade Area of the Americas: The Extension of NAFTA to Southern Hemisphere Countries." *Proc. of Florida Agricultural Conference & Trade Show* (Sept. 1998): 53-6.
- VanSickle, John J. "*The Free Trade Area of the Americas: Considerations Important for Agriculture*." Working paper (Feb 12, 1998): 13 pp.
- VanSickle, John J. "*Monitoring Competition with Mexico*." Report of Tomato Research Supported by the Florida Tomato Committee 1997-1998 (Sept. 1998): 61-68.
- Spreen, Thomas H., John J. VanSickle, Charlene M. Brewster. 1999. "Foreign Competition and Trade." Trade Liberalization and Globalization of World Markets. Kluwer Academic Publishers. Norwell, MA. Pp. 225-29.
- VanSickle, John J. Competitiveness of U.S. Agriculture. In press. Kluwer Academic Publishers. Norwell, MA.
- VanSickle, John J. 1999. Pesticides: Managing Risks and Optimizing Benefits. American Chemical Society. Washington, D.C. pp. 225-229.
- Deepak, M.S., Thomas H. Spreen, John J. VanSickle., 1999. "Trade Distortions in a Free Trade Zone: The Case of Sanitary and Phytosanitary Barriers." Flexible Incentives for the Adoption of Environmental Technologies in Agriculture. Kluwer Academic Publishers. Norwell, MA.
- VanSickle, John J. 1999. "*Vegetables*". University of Florida. Gainesville. FFRE-144.

- Medina, Sara , John VanSickle. 1999. "Final Report-Phase IV: An Economic Analysis of Best Management Practices (BMPs) for Potatoes Grown in the Tri-County Agricultural Area of North Florida." University of Florida. Gainesville, Florida.
- VanSickle, John J. 1999. "Estimating Producer and Consumer Benefits of the U.S. Department of Commerce Suspension Agreement with Mexico." University of Florida. Gainesville, Florida 99 Report of Tomato Research
- Gordon, John , Cantliffe, Dan, Bill Messina, Roger Newton, Fritz Roka, Mickie Swisher. 1999. "Domestic and International Business Climate/Demographics." University of Florida. Gainesville, Florida. Florida FIRST Base Papers. 43-56.
- Hochmuth, George, John VanSickle, Dan Cantliffe, Robert Hochmuth, William Stall, Phyllis Gilreath, Ken Shuler, Charles Vavrina, Jay Scott, David Schuster, Randy Ploetz. 1999. Florida FIRST Base Paper Vegetables. University of Florida. Gainesville, Florida. Florida FIRST Base Papers. 305-14.
- VanSickle, John J., Charlene Brewster, Thomas H. Spreen. 1999. "Impact of Methyl Bromide Ban on the U.S. Vegetable Industry." University of Florida Food and Resource Economics Dept.. Gainesville, FL. SP 99-11.
- Knapp, J.L., John J. VanSickle, M.S. Deepak, Armand Padula, Ron Davis, Craig Osteen, Osvaldo Cotte, Elizabeth Grafton-Caldwell, John A. Menge, Joseph W. Noling, David P. Tucker, Will Wardowski, Ronald P. Muraro. 1999. *Citrus Commodity: A Biologic and Economic Assessment of Pesticide Usage*. University of Florida. Gainesville, FL. NAPIAP Report No. 1-CA-99.
- VanSickle, John J., Charlene Brewster, Thomas H. Spreen. In press. "Impact of a Methyl Bromide Ban on the U.S. Vegetable Industry." University of Florida. Gainesville, Florida. *Exp. Stat. Bull.* 333.
- VanSickle, John J. 1999. "Market Opportunities." *Citrus & Vegetable Magazine* 63/January: 32.
- VanSickle, John J. 1999. "Outlook: Prices Uncertain." *Citrus & Vegetable Magazine* 63/February: 42.
- VanSickle, John J. 1999. "Opportunities Once Look Like Failures in a Different Time." *Citrus & Vegetable Magazine* 63/March: 52-53.
- VanSickle, John J. 1999. "Different Industry - Same Problems." *Citrus & Vegetable Magazine* 63/April: 44-45.
- VanSickle, John J. 1999. "Fence That Critter." *Citrus & Vegetable Magazine* 64/December: 30-31.
- VanSickle, John J. 1999. "What's Wrong With the Futures Market?" *Citrus & Vegetable Magazine* 63/July: 24-25.
- VanSickle, John J. 1999. Acting on Opportunities. *Citrus & Vegetable Magazine* 64/November: 50-51.
- VanSickle, John J. 1999. "Weigh Alternatives Before/After USDA Forecast." *Citrus & Vegetable Magazine* 64/September: 46-47.
- VanSickle, John J. 1999. "New FCOJ-2 Contract Offers More Secure Hedging Opportunities." *Citrus & Vegetable Magazine* 64/October 44-45.
- VanSickle, John J. 1999. "It's Never Too Early to Think About Next Year." *Citrus & Vegetable Magazine* 63/May: 40-41.
- VanSickle, John J. 1999. "Off-Season Appraisals." *Citrus & Vegetable Magazine* 63/August: 28-29.

- VanSickle, John J, Charlene Brewster, Thomas H. Spreen. 1999. "Sustainable Impacts for a Seamless Transition in the U.S. Vegetable Industry." 1999 Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions. 19-1 to 19-2.
- Gordon, John R., William A. Messina, Jr., Daniel J. Cantliffe, Roger D. Newton, Fritz M. Roka, Marilyn E. Swisher, John J. VanSickle. 1999. "Florida Agriculture: Domestic and International Business Climate/Demographics." T-STAR Workshop X. Mitigating the Effects of Exotic Pests on Trade and Agriculture. 15-26.
- VanSickle, John J. 1999. "Critical Commodities in the Caribbean Basin: A Florida Perspective." T-STAR Workshop X: Mitigating the Effects of Exotic Pests on Trade and Agriculture. 191-96.
- VanSickle, John J. 1999. "New Factors Affecting Cattle Prices." 48th Annual Beef Cattle Short Course Proceedings: Bullish on Quality Beef. 85-90.
- VanSickle, John J. 1999. "Managing Risk in the Supply Chain." Lipidex 99 Symposium & Trade Fair.
- VanSickle, John J. 2000. "Perspectives on Farm Economic Relief: Issues Pertinent to Fruit and Vegetable Growers." Working paper. University of Florida. Gainesville, FL.
- Spreen, Thomas H., VanSickle, John J., Brewster, Charlene M. "Trade Liberalization and Globalization of World Markets". *Trade Distortions in a Free Trade Zone: The Case of Sanitary and Phytosanitary Restrictions* Editor: Schmitz, Andrew, Moss, Charles B., Taylor, Timothy. Norwell, MA: Kluwer Academic Publishers (2001): 253-268.
- VanSickle, John J. 2001. "*Critical Agricultural Issues in Negotiating a Free Trade Area of the Americas*". Gainesville, FL: University of Florida Extension, EDIS FE 284.
- VanSickle, John J. 2001. "*Estrategias de Mercado para Productores de Vegetales*". Gainesville, FL: University of Florida, EDIS FE288.
- VanSickle, John J. 2001. "*Terrorist Attacks in New York City and Washington, D.C.: Implications for the Florida Vegetable Industry*". Gainesville, FL: University of Florida, EDIS FE314.
- VanSickle, John J., Wagner, David . 2002. "*Using Futures to Hedge Feeder Cattle in Florida*". Gainesville, FL: University of Florida, EDIS 329.
- VanSickle, John J. 2001. "*Vegetables*". Florida Food and Resource Economics FFRE-146: Outlook 2001.
- VanSickle, John J. 2001. "*Implications for the Florida Vegetable Industry*". Florida Food & Resource Economics FFRE 148: The Terrorist Attacks in New York City and Washington, D.C.: Economic Implications for Florida.
- VanSickle, John J. 2001. *Cuban Vegetable Industry*. HortScience. 36/3: 445.
- VanSickle, John J. 2001. "*Policy and Trade Issues Critical to Florida Tomato Growers*." 2001 Florida Tomato Institute PRO 518.
- VanSickle, John J. 2001. *Farm Bill - Past, Present and Future: Regional Perspectives on the Farm Bill*. Proceedings of the 1st International Agricultural Trade & Policy Conference.
- Wysocki, Allen , VanSickle, John J. 2001. "*Vegetable Situation and Outlooks for Southeast Agriculture*." Proceedings of the 1st International Agricultural Trade & Policy Conference. October , 2001.
- VanSickle, John J. 2001. "*Fresh Fruit and Vegetable Industry Positions on New Farm Legislation*". College Station, Texas: Texas Agricultural Experiment Station, CNAS 2001-3.

- VanSickle, John J., Evans, Edward. 2001. "*The Florida Tomato Committee's Education and Promotion Program: An Evaluation*". Gainesville, FL: University of Florida.
- Mulkey, David , Haydu, John , Hewitt, Tim , VanSickle, John J. 2001. "*FRED Strategic Planning: Extension Task Force Report*". Gainesville, FL: University of Florida.
- VanSickle, John J. 2001. "*Cost Updates for Fresh Tomatoes Imported from Mexico*". Gainesville, FL: University of Florida.
- VanSickle, John J. 2001. "*Submitted Testmony Related to Kansas House Bills 2279 - 2281.*" Gainesville, FL: University of Florida.
- VanSickle, John J. 2001. "*Submitted Testmony Related to Kansas Senate Bill 223.*" Gainesville, FL: University of Florida.
- VanSickle, John J. 2001. "*Statement of John J. VanSickle to the U.S. International Trade Commission on Trade Distorting Support in the EU.*" Gainesville, FL: University of Florida.
- VanSickle, John J. 2001. "*Submitted Testimony Regarding the Free Trade Area of the Americas to Committee on Agriculture, U.S. House of Representatives.*" Gainesville, FL: University of Florida.
- VanSickle, John J. 2001. "*The Impact of the Suspension on the U.S. Fresh Tomato Industry.*" Gainesville, FL: University of Florida.
- VanSickle, John J., Spreen, Thomas H. 2001. "*Outlook for Fresh and Processed Citrus in the United States.*" California Citrus Mutual Journal. (2001): 21 -24.
- VanSickle, John J. 2001. "*The Need for Risk Management.*" Citrus & Vegetable Magazine. 65/5 (2001): 48.
- VanSickle, John J. 2001. "*Synthetic Puts for Low Markets.*" Citrus & Vegetable Magazine. 65/6 (2001): 60.
- VanSickle, John J. 2001. "*Beware of Bear Markets.*" Citrus & Vegetable Magazine. 65/7 (2001): 58.
- VanSickle, John J. 2001. "*Begin Managing the 2002 Crop.*" Citrus & Vegetable Magazine. 65/8 (2001):56 -57.
- VanSickle, John J. 2001. "*Manage the Market.*" Citrus & Vegetable Magazine. 65/9 (2001): 40 -41.
- VanSickle, John J. 2001. "*Fresh Market Outlook.*" The Tomato Magazine. 5/4 (2001): 18 -19.
- VanSickle, John J. 2001. "*Managing Market Risk.*" Citrus & Vegetable Magazine. 65/11 (2001): 56.
- VanSickle, John J. 2001. "*Learning Lessons in the Markets.*" Citrus & Vegetable Magazine. 65/12(2001): 44 -45.
- VanSickle, John J. 2001. "*Managing Markets.*" Citrus & Vegetable Magazine. 66/1 (2001): 52 -53.
- VanSickle, John J. 2001. "*Managing Risk in Marketing Pools.*" Citrus & Vegetable Magazine. 66/2 (2001): 42.
- VanSickle, John J. 2001. "*Pricing Your Fruit Now.*" Citrus & Vegetable Magazine. 66/3 (2001): 36 -37.
- VanSickle, John J. 2001. "*Industry Leaders Look into the Future.*" Citrus & Vegetable Magazine. 66/4 (2001): 46.
- VanSickle, John J. 2001. "*Managing Price Risk.*" Citrus & Vegetable Magazine. 66/4 (2001): 58 -59.

- VanSickle, John J. 2001. "*The Situation and Outlook in the Fresh Tomato Market.*" The Tomato Magazine. 5/4 (2001): 18 –19.
- Anderson, Bruce , Caplan, Frieda , Doherty, Linda , Eastwood, David , Estes, Ed , Hanas, Rick , Kirschling, Patrick , VanSickle, John J. 2002. "*Comprehensive Analysis of New Jersey's Wholesale Fruit and Vegetable Marketing System.*" Trenton, NJ: New Jersey Department of Agriculture.
- VanSickle, John J. 2002. "*Regional Perspectives on the Farm Bill.*" Proceedings of the 2nd International Agricultural Trade and Policy Conference. November, 2002.
- Wysocki, Allen F., VanSickle, John J. 2002. "*The Situation and Outlook in the Southeast Fresh Vegetable Market.*" Proceedings of the 2nd International Agricultural Trade and Policy Conference November, 2002.
- VanSickle, John J., NaLampang, Sikavas. 2002. "The Impact of the Phase Out of Methyl Bromide on the U.S. Vegetable Industry." University of Florida IW 02-3.
- VanSickle, John J. 2002. "*The Situation and Outlook in the Fresh Vegetable Market.*" AgFirst Farm Credit, Columbia, SC.
- Cantliffe, Daniel J., VanSickle, John J. 2002. "*Global Competition, Greenhouse Production: Are They Something for Florida Vegetable Producers to Consider?*" Florida Agricultural Conference & Trade Show. Lakeland, FL.
- VanSickle, John J., Evans, Edward A. 2002. "*Trade and Investment: Opportunities and Constraints Between the U.S. and South Korea.*" Economic Forum for Kyonggi Province/ State of Florida Cooperation: Changing Conditions and Challenges Ahead for Kyonggi/ Florida Economic Cooperation. June , 2002: 28-54.
- VanSickle, John J. 2002. "Risk Management Research for Citrus." *Citrus & Vegetable Magazine*. 66/January (2002): 30–31.
- VanSickle, John J. 2002. "Buying a Synthetic Put." *Citrus & Vegetable Magazine*. 66/February (2002): 50–51.
- VanSickle, John J. 2002. "Watch the Market from Both Sides of the Page." *Citrus & Vegetable Magazine*. 66/March (2002): 56–57.
- VanSickle, John J. 2002. "Strategic Planning." *Citrus & Vegetable Magazine*. 66/April (2002) 60 –61.
- VanSickle, John J. 2002. "Planning." *Citrus & Vegetable Magazine*. 66/May (2002): 52.
- VanSickle, John J. 2002. "Off-Season Appraisals." *Citrus & Vegetable Magazine*. 66/July (2002): 42 –43.
- VanSickle, John J. 2002. "Closing Out the Old, Focusing on the New." *Citrus & Vegetable Magazine*. 66/August (2002): 42 –43.
- VanSickle, John J. 2002. "Risk Management and Pooling." *Citrus & Vegetable Magazine*. 66/September (2002): 30 –31.
- VanSickle, John J. 2002. "Price Risk Management." *Citrus & Vegetable Magazine*. 66/November (2002): 24 –25.
- Cantliffe, Daniel J., VanSickle, John J. 2002. "Can Florida Compete with the Spanish and Dutch Greenhouse Industries: Part 2." *The Tomato Magazine*. 6/August (2002): 8 –11.

Cantliffe, Daniel J., VanSickle, John J. 2002. "Can Florida Compete with the Spanish and Dutch Greenhouse Industries: Part 1." *The Tomato Magazine*. 6/ June (2002): 11 -12.

VanSickle, John J. 2002. "Agri-nomics." *The Florida Agri-Journal*. II/5 (2002): 6.

VanSickle, John, R. McEowen, N. Harl, R. Taylor and J. Connor. May, 2003. "Country of Origin Labeling: A Legal and Economic Analysis." University of Florida IATPC Policy Brief PBTC 03-5.

Computer Software:

"VEG-BUD Fresh Vegetable Budget Generator". Lotus Spreadsheet for budgeting growing and marketing costs of fresh vegetables. 1990. With Emil Belibasis and Tom Stevens.

"Internet Market Information System" 1992. Software for distributing agricultural market news on the Internet Information Network. With Doug Dillard and Bo Yang. (<http://mis.ifas.ufl.edu/~market/market.html>).

"Voice Market Information System", Software for distributing market news using touchtone telephones. 1992. With Tao Song and Doug Dillard.

"Market Information Systems" Computerized Database of Market News on the IFAS Vax Computer Network. 1992. With Tao Song, Thomas Stevens and Doug Dillard.

VanSickle, John J. *University of Florida Market Information System*. 2001. <http://mids.ifas.ufl.edu/> With Xiangli Zhou. Market information system for agricultural products, including data from USDA Agricultural Marketing Service

VanSickle, John J.. *Market Information Database System*. 2001. <http://mis.ifas.ufl.edu> With Xiangli Zhou. A database has been constructed for market news published by USDA Agricultural Marketing Service for tomatoes

VanSickle, John J.. *MIS Trading Game* . 2001. <http://tgame.ifas.ufl.edu> With Giancarlo Espinosa. This trading game was developed for use in teaching students how to use the futures and options markets for investing and for risk management.

MAJOR CONSULTATIONS OUTSIDE THE UNIVERSITY

"Florida-Mexico Competition in Supplying Winter Fresh Vegetables." Seminar presented to USDA, Washington, D.C., June 3, 1985 and the UNPH (Mexican Vegetable Growers Association), June 6-7, 1985.

"Determining Damages to Vegetable Crops from Spray Contamination." Schwarts Farms, Inc., Sarasota, Florida, 1986-88.

"Computer Aided Marketing Programs in the United States." Seminar presented at the International Computerized Marketing Seminar, Essec University, Paris, France, February, 1987.

"Market Information Programs for Developing Countries." Seminar presented to the Division of Products and Market Development, International Trade Center, Geneva, Switzerland, March 1987.

"Determining the Feasibility of Exporting Strawberries and Bramble Berries to the U.S. from Select Caribbean Countries." Chemonics International, Washington, DC., El Salvador, Costa Rica. 1987.

"Determining Damages to Watermelons from Spray Contamination." Doehill Associates. Sarasota, Florida. 1987-88.

- "Determining Damages to Watermelons from Faulty Irrigation Equipment." T.-Systems Corporation. Tallahassee, Florida. 1988.
- "Developing Extension Programs in Marketing." Rutgers University. New Brunswick, New Jersey. 1988.
- "Innovative Approaches to Cooperative Management, Finance and Trade." Agricultural Cooperative Development, Inc. Washington, DC., 1988-89.
- "Determining Damages Caused by Shipping and Selling Poor Quality Produce." Lamantia, Cullum, Collier and Co., Inc., Weslaco, Texas. 1989.
- "Developing a Market News Database." Statistica, Inc. Washington, DC, 1989.
- "The Tax Liability of Interest Income in a Non-Exempt Cooperative." Internal Revenue Service. Jacksonville, Florida. 1989.
- "Analysis of Agribusiness Firm Level Assistance in the Horticulture Industry for Kenya." DPRA, Inc., Manhattan, Kansas. 1990.
- "Analysis of Market Information Systems in Hungary." ACIDI, Washington, D.C. 1991.
- "Feasibility of Market Information Systems in Bolivia". Ronco, Inc., Washington, D.C. 1991.
- "Impacts from Marketing Mexican Vegetables." Law offices of O'Connor Cavanaugh, Nogales, Arizona. 1992.
- "Damages to Watermelons from Spray Damage". Law offices of Rod Bowdoin, Lake City, Florida. 1992.
- "Valuing the Frogpond Agricultural Area." Accounting Office of Gerson & Preston. Miami, Florida. 1995.
- "Competition in the Fresh Tomato and Bell Peppers Industries." Law Offices of Stewart & Stewart. Washington, D.C. 1996. As part of the Section 201 petition filed with the U.S. ITC and the Antidumping Petition filed with the U.S. Department of Commerce.
- "Damages to Tomatoes from Faulty Ripening Room Equipment." Law Offices of Sullivan, Ward, Bone, Tyler & Asher. Detroit, Michigan. 1996-97.
- "Competition in the Live Cattle Industry." Law Offices of Stewart & Stewart, Washington D.C. 1998-2000. As part of the antidumping petition filed with the U.S. Department of Commerce.
- "Competition in the Greenhouse Tomato Industry." Law Offices of Stewart & Stewart, Washington D.C. 2000-2002. As part of the antidumping petition filed with the U.S. Department of Commerce.
- "The Impact of Facet on Arkansas Vegetable Growers." Law Offices of Faegre & Benson, Des Moines, Iowa. 2002-.

TEACHING AND/OR INSTRUCTIONAL ACCOMPLISHMENTS

Course Materials Development and Teaching

- Spring 1980** Developed course material and taught AEB 3111, Linear Programming Applications in Agriculture.
- Spring 1984** Developed course material along with Dr. Ralph Eastwood to teach new course, AEB 4392, Cooperatives in Agriculture.
- Spring 1990** Developed course material and taught AEB 3306, Commodity Marketing.

Spring 1990 Developed course material and arranged for class visit in New York City for AEB 4314, Terminal Markets.

Spring 1991 Taught AEB 3306, Commodity Marketing.

Spring 1991 Developed course material and arranged for class visit in Chicago for AEB 4314, Terminal Markets.

Spring 1992 Taught AEB 3306, Commodity Marketing.

Spring 1992 Taught AEB 4314, Terminal Markets, and arranged for class trip to Chicago, Illinois.

Spring 1993 Taught AEB 3306, Commodity Marketing.

Spring 1993 Taught AEB 4314, Terminal Markets, and arranged for class trip to Chicago, Illinois.

Spring 1994 Taught AEB 3306, Commodity Marketing.

Spring 1994 Taught AEB 4314, Terminal Markets, and arranged for class trip to Chicago, Illinois.

Summer 1995 Taught AEB 3306. Commodity Marketing.

Spring 1996 Taught AEB 3306. Commodity Marketing.

Spring 1996 Taught AEB 4314. Terminal Markets, and arranged class trip to Chicago, Illinois.

Spring 1997 Taught AEB 3306. Commodity Marketing.

Spring 1997 Taught AEB 4314. Terminal Markets, and arranged class trip to Chicago, Illinois.

Spring 1998 Taught AEB 3306. Commodity Marketing.

Spring 1998 Taught AEB 4314. Terminal Markets, and arranged class trip to Chicago, Illinois.

Spring 1999 Taught AEB 3306. Commodity Marketing.

Spring 1999 Taught AEB 4314. Terminal Markets, and arranged class trip to Chicago, Illinois.

Spring 2000 Taught AEB 3306. Commodity Marketing.

Spring 2001 Taught AEB 3306. Commodity Marketing.

Spring 2002 Taught AEB 3306. Commodity Marketing.

Spring 2003 Taught AEB 3315. Commodity Marketing.

Spring 2003 Taught AEB 4314. Terminal Markets, and arranged class trip to Chicago, Illinois.

Worked individually with numerous undergraduate and graduate students in special problem courses.

Supervised students in senior term projects for the Computer and Information Sciences Department, 1988-89 and 1996/97.

Served on the following graduate student committees:

Master of Agricultural Management and Resource Development:

Rom Alderman, 1982

Ehode Ekanga, 1983

Master of Agribusiness Management

James Smithson, chairman, 2000
David Wagner, chairman, 2001
Carolina Mendoza, chairman, 2002

Master of Science (non-thesis):

Arafin bin Twang, 1984
Sharon Moon, 1988
Endah Srinarni, 1991
Columban George, chairman, 1997.
Jeff Phillips, chairman, 1997.

Master of Science (thesis):

Guillermo Alvarado, chairman, 1982
Abby Fromang, chairman, 1983
German Molina, chairman, 1988
Mario Castejon, chairman, 1990
Sam Scott, chairman, 1991
Kenrick Jordan, chairman, 1991
Reginald Adamus, chairman, 1992
Tao Song (Computer and Information Sciences), 1992
Keith Birkhold (Fruit Crops), 1992
Joseph Ranney, chairman, 1993
Michele Andre, chairman, 1996.
Monica Escalares, 1996.
Sara Medina, Chairman, 1997.
Xiangli Zhou (Computer and Information Sciences), 1999
Napaporn Girapunthong, chairman, 2001
Mariano Jimenez, chairman, in progress
Christian Salnars, chairman, in progress

Doctor of Philosophy:

Rigoberto Lopez, 1983
James Ansoanuur, 1988
Kenrick Jordan, chairman, 1995.
Sam Scott, chairman, 1996.
Charles Douglas, chairman, 1997.
Sakavas Nalampang, chairman, in progress
Jione Jung, chairman, in progress

Other Teaching Accomplishments

Abby Fromang M.S. thesis won the 1984 American Institute of Cooperation Award for Most Outstanding M.S. thesis written on the subject of cooperatives.

German Molina M.S. thesis won the 1988 Food Distribution Research Society Applebaum Scholarship Award for Most Outstanding Thesis written on the subject of food distribution.

Kenrick Jordan M.S. thesis selected as outstanding MS thesis for the Food & Resource Economics Department, 1991.

Joseph Ranney M.S. thesis selected as outstanding MS thesis for the Food & Resource Economics Department, 1993.

Napaporn Girapunthong, M.S. thesis selected as outstanding MS thesis for the Food & Resource Economics Department, 2002.

EXTENSION PROGRAM

- The focus of my extension program has been to develop materials for the produce industry that may be used by growers, shippers and other members of the marketing system. Numerous manuscripts have been developed to communicate information to those within the agricultural industry. Presentations have been made to academic and industry groups throughout the U.S. and in many foreign countries. Several program areas have been developed to contribute this program.
- Market news has been a focus on which many within the agricultural industry have benefited. Market Information Systems (MIS) have been developed for computer access to a database of all USDA market news by IFAS state and county specialists. The public has been given access to this database by touch-tone telephone through a Voice Market Information System (VMIS), and by computer access through an Internet Market Information System (IMIS). Each of these systems has grown and has become important elements on which the marketing system for agriculture has relied on to become more efficient. IFAS specialists access MIS almost 3,000 times each year. Public access to IMIS exceeds 2,400 each week. These efforts earned the Southern Agricultural Economics Association and the American Agricultural Economics Association Distinguished Extension Program Awards in 1987. Feasibility studies funded by USDA served as foundations on which USDA has upgraded their information networks.
- Work in the area of international trade has also been important for fresh fruit and vegetable growers. Significant work has been done in assessing competition between Florida and Mexico. USDA funded 2 projects for assessing competition in the winter fresh vegetable industry. Information was developed to help industry participants and policy makers understand the North American Free Trade Agreement (NAFTA) and its potential impacts on the winter fresh vegetable industry. Discussions continue about NAFTA and the effect it is having on U.S. growers. The Florida tomato industry and IFAS have funded efforts to develop tools for monitoring NAFTA. Assistance has been given to the Florida tomato industry in applications to the International Trade Commission for relief from imports of Mexican tomatoes and bell peppers. Information has been developed to help policy makers in their decisions concerning the fresh produce industry.
- Interdisciplinary research and extension have been critical in this program. Cooperative research and extension programs have been developed with production and post harvest specialists in the Horticultural Sciences Department. The importance of using selected pesticide groups for agriculture have been determined in much of this work as has the importance of post harvest handling practices. The Florida tomato industry has awarded grants to study the marketing system for fresh tomatoes and develop proposals for improving the marketing efficiency. Studies of the citrus marketing system also have been conducted to improve the efficiency with which fresh and processed citrus are marketed.

GRANTS AND CONTRACTS

- P.I., "A Proposal to Develop Methodology for Determining Financial Structure in Cooperatives." Agricultural Cooperative Service - USDA. 1981-84. \$25,991.
- P.I., "Determine the Feasibility for a Computerized Electronic Marketing System for Fresh Fruits and Vegetables." Agricultural Marketing Service - USDA. 1983-85. \$67,720.
- Co-PI, "Computer Extension of Satellite Weather Data to County Extension Offices." Sciences and Education Administration - USDA. 1983-84. \$17,000. with David Martsolf, P.I., Fruit Crops Department.
- P.I., "Assessing Competition Between Florida and West Mexico in Supplying Fresh Winter Vegetables to U.S. Markets." Economic Research Service - USDA. 1984-85. \$20,000.
- P.I., "Evaluating the Contributions of Computer Aided Marketing of Produce to the Efficiency of the Produce Marketing Industry." Agricultural Marketing Service - USDA. 1985-86. \$102,000.
- P.I., "Computer Dissemination of Market News Information." Agricultural Marketing Service - USDA. 1985-86. \$19,250.

- P.I., "Computer Feasibility of Market News Information." Agricultural Marketing Service - USDA. 1986-88. \$41,462.
- P.I., "Feasibility of Eliminating All U.S. #3 Grade Tomatoes or Only Some Sizes of U.S. #3 Grade." Florida Tomato Committee. 1989-90. \$7,500.
- P.I., "Voice Messaging System for Market News." Agricultural Marketing Service - USDA. 1989-91. \$50,000.
- P.I., "An Economic Assessment of Costs and Competition in Supplying Winter Fresh Vegetables to U.S. Markets." Economic Research Service - USDA. 1992-93. \$20,000.
- P.I., "Voice Market Information System for Market News Field Offices." Agricultural Marketing Service - USDA. 1992-94. \$50,000.
- Co-PI, "Controlled Atmosphere Shipping of Caribbean Produce and Marketing Implications." Caribbean Basin Advisory Group. 1992-95. \$127,200. with Steve Sargent, P.I., and Jeffrey Brecht, Horticultural Sciences Department, and Jerry Bartz, Plant Pathology Department.
- P.I., "A Long Term Assessment of the Loss of Methyl Bromide on Florida." CSRS - USDA. 1993-95. \$60,000. with Thomas Spreen, Food and Resource Economics Department.
- Co-PI, "Water Quality Monitoring and Assessment of Agricultural BMP's." St. John's Water Management District. 1993-95; \$7,700 for economic evaluation. 1995-96; \$7,700 for economic evaluation. with George Hochmuth, P.I., Horticultural Sciences Department, and Ed Hanlon, Soils and Water Sciences Department.
- Co-PI, "Develop a Model of U.S. Tomato Production and Consumption to Estimate Impacts of Potential Pesticide Regulations." CSRS - USDA. 1994-96. \$25,000. with Thomas Spreen, P.I., Food & Resource Economics Department.
- Co-PI, "Cuban Agricultural Competitiveness and Prospects for Trade." Economic Research Service- USDA. 1994-96. \$29,000. with Thomas Spreen, P.I., Food and Resource Economic Department.
- Co-PI, "NAFTA Center: Monitoring Impacts of NAFTA." IFAS Research Dean Special Project. 1994-95. \$40,000. 1995-96 - \$40,000. 1996-97 - \$20,000. With Thomas Spreen, P.I., Food & Resource Economics Department.
- Co-PI, "Factors Affecting the Success of Horticultural Cooperative Packinghouses." USDA Agricultural Cooperative Service. 1994-96. \$30,000. With Patrick Byrne, P.I., Food & Resource Economics Department.
- Co-PI, "Efficiency in Florida Fresh Citrus Packinghouses." Florida Department of Citrus. 1995-96. \$20,000. With Ron Muraro, P.I., Citrus Farm Management and Marketing Economist, Bill Miller, Agricultural Engineer, and Will Wardowski, Horticulturalist, Lake Alfred Research and Education Center.
- P.I., "Monitoring NAFTA for the Florida Tomato Industry." Florida Tomato Committee. 1995-96. \$35,000.
- P.I., "Development of a MIS Historical Database (MISH) for Internet and CD Access." Food & Resource Economics Department Special Project. \$5,000. 1995-96.
- P.I., "An Evaluation of the Provisions and Programs of the Florida Tomato Committee." Florida Tomato Committee. 1995-96. \$52,000. with Steve Sargent, Horticultural Sciences Department.
- Co-PI, "Pesticide Impact Assessment for U.S. Citrus." USDA, CREES. 1995-96. \$17,000 for economic evaluation. With Joseph Knapp, P.I., Entomologist, Lake Alfred Research and Education Center.
- P.I., "Monitoring Competition with Mexico and Developing a NAFTA Monitor Home Page." Florida Tomato Committee. 1996-97. \$30,000.
- P.I., "Development of an Internet Futures Market Trading Game." Minigrant supported by the Dean for Teaching. IFAS. 1996-97. \$3,000.

- P.I., "Monitoring the U.S. Department of Commerce Suspension Agreement with Mexico – Assessing the Impacts and Considering the Alternatives." Florida Tomato Committee. 1997-98. \$30,000.
- P.I., "An Evaluation of the Economic Viability of Alternatives to Methyl Bromide for Soil Fumigation: An Analysis of the North American Fresh Vegetable Market." USDA Economic Research Service. 1997-98. \$60,000.
- Co-PI, "Field Scale Demonstration/Validation Studies of Alternatives for Methyl Bromide in Plastic Mulch." USDA Agricultural Research Service. 1996-2001. Total grant \$192,500; \$40,000 for economic evaluation. With Joe Noling, P.I., Nematology, Citrus Research & Education Center.
- P.I., "Development of Internet Market Information Systems." Special project funded by Vice President of Agr. & Nat. Res., Univ. Flor. 1997-98. \$30,000.
- P.I., "Estimating Producer and Consumer Benefits of the Department of Commerce Suspension Agreement with Mexico." Florida Tomato Committee. 1998-1999. \$30,000.
- P.I., "International Trade and Policy for the Florida Tomato Industry." Florida Tomato Committee. 1999-2000. \$30,000.
- P.I., "Economics and Competitiveness in the Florida Tomato Industry." Florida Tomato Committee. 2001-2002. \$30,000.
- PI, "Information Gathering and Analysis for Specialty Crop Insurance." USDA Federal Crop Insurance Corporation. 2001-2003. \$397,000.
- PI, "Critical Use Exemption Development for Methyl Bromide in the Florida Vegetable Industry." Florida Fruit & Vegetable Industry Research Foundation. 2002. \$50,000.
- PI, "Florida Agricultural Competitiveness and Trade." Florida Dept. Agricultural & Consumer Services. 2002-2005. \$1,000,000
- PI, "International Trade and Marketing Issues in the Florida Tomato Industry." Florida Tomato Committee. 2002-2003, \$25,000.

UNIVERSITY AND PROFESSIONAL SERVICE

Departmental Committees

- Public Relations and Publicity, 1981-86; chairman, 1981-84
- United Way chairman 1981
- Executive Council, elected representative for assistant professors, 1983-84
- Extension Committee, 1983-84, 1987-88, 1992-94, 1994-96, 2002-.
- Department Freeze Assessment Committee, 1981, 1982
- Search and Screen Committee for Undergraduate Teaching Position, 1981
- Search and Screen Committee for Extension position with Microcomputer Applications, 1984
- Search and Screen Committee for Area Ornamental Horticulture Economist Position, 1984
- Seminar Committee, 1989-91, chairman, 1991.
- Departmental Ph.D. Qualifying Exams Committee, 1993.
- Advisory Committee, elected representative for 1995-97.
- Computer & Information Services Committee, 1997-98.
- Peer Review Committee for Richard Weldon, 1997.
- Graduate Committee, 1999-2002.

Institute of Food and Agricultural Sciences Committees

- Agriculture in Transition (Food Industry Productivity). 1980
- Long Range Planning Conference, 1982-1983 -- Committees on Marketing and Distribution, Credit, Tomato, and Vine Crops
- Review of State-Wide Vegetable Research Program, 1983-84
- Search and Screen Committee for County Extension Faculty, 1984, 1992

Florida Tomato Institute Planning Committee, 1983
IFAS Marketing Task Force, 1985-86
IFAS Extension Conference Planning Committee, 1985-86
IFAS Managing Your Farm Alternatives Conference Planning Committee, 1987
Contact Person, FL 20 Cooperative Extension Program, "Agricultural Marketing, Production and Finance in Florida." 1987-1995.
Leader, FL120 Cooperative Extension Program, "Managing Competitiveness in Florida Agriculture Through Management, Finance, Marketing, and Policy in Florida." 1996-2000.
IFAS Privatization Committee. 1995.
IFAS State Extension Conference Planning Committee. 1996-97.
IFAS Salary Performance Pay Plan for Professors Committee. 2001-2002. Chair, 2002.

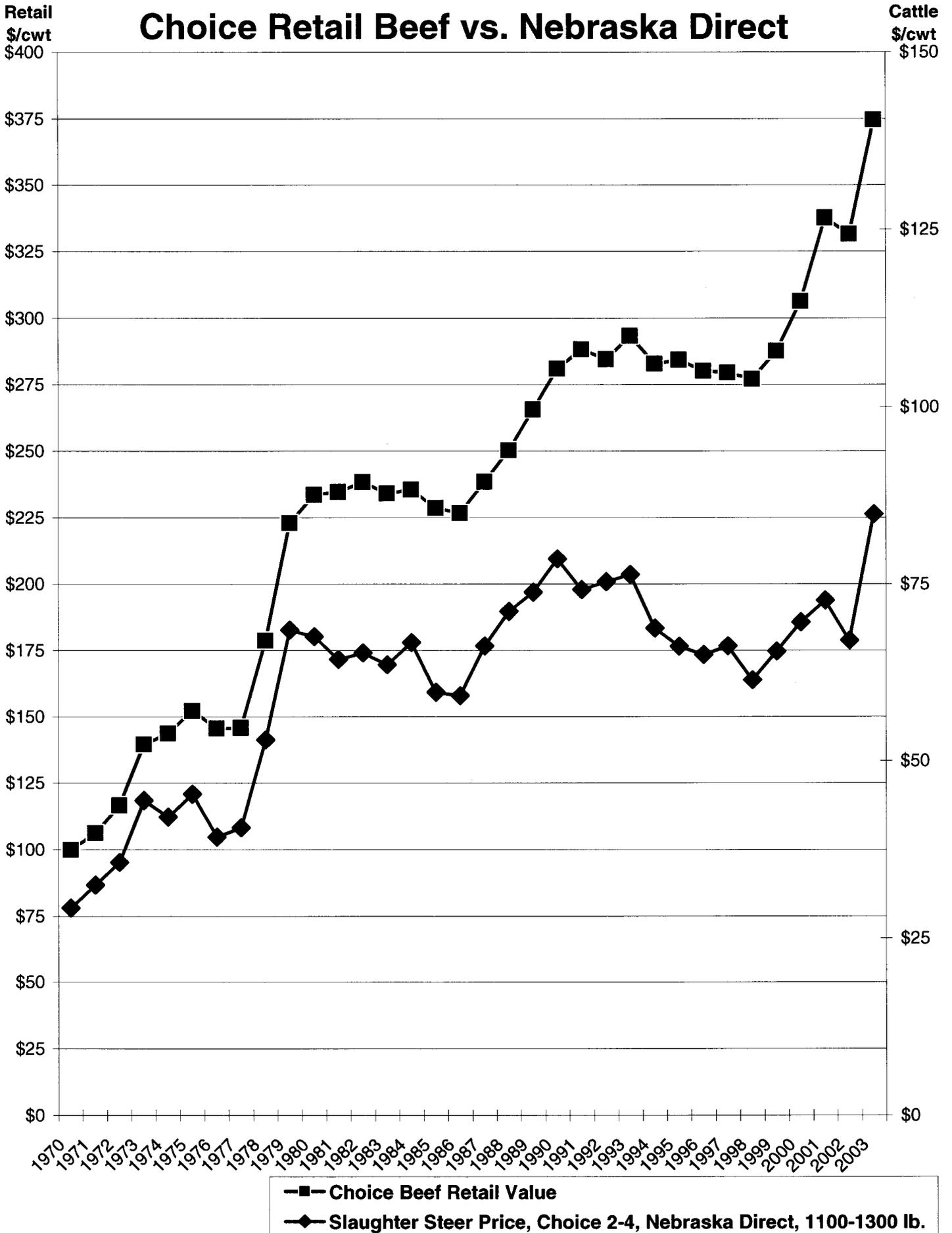
State and National Committees

Honorary Board Member, Florida Council of Farmer Cooperatives, 1983-1988.
Chairman, National Advisory Committee for Computerized Marketing of Fresh Fruits and Vegetables, 1983-85.
Secretary, Southern Regional Research Committee S-129, Organization and Efficiency of the Fruit and Vegetable Production and Marketing Sub-sector in the South, 1980-82.
Chairman, Southern Regional Research Committee S-178, Structural and Operational Efficiency of the Fruit and Vegetable Production Marketing System, 1982-84, Member 1984-86.
Member, Extension Committee of the American Agricultural Economics Association, 1983- 86 and 1991-1994.
Member, 4-State Committee on Cooperative Research and Extension, 1981-84.
Secretary/Treasurer, Food Distribution Research Society, 1987-1988.
Member, Southern Regional Research Committee S-222, Competition and Change in Fruit and Vegetable Production and Marketing Systems, 1987-present.
Member, Southern Region Extension Marketing Committee, 1995-present. Secretary 1998-99, Chairman 1999-2000.
Member, United Nations Environmental Programme Technology and Economic Assessment Panel. Economic Options Committee Methyl Bromide Task Force. 1997.
Member, United Nations Environmental Programme Technology and Economic Assessment Panel. Economic Options Committee. 1997-2001.

Other Professional Services

Served as reviewer for numerous articles published by IFAS, Southern Journal of Agricultural Economics, Journal of Agricultural and Applied Economics, American Journal of Agricultural Economics, Journal of Food Distribution Research Society, and other journals.
Judge of Florida Council of Farmer Cooperatives FFA Cooperative Contest, 1982 - 1984.
Session Chairman for Fruit and Vegetables Outlook at the Southern Outlook Conference, 1983, 1986, 1997.
Reviewed papers submitted for presentation at the 1988, 1993, and 1994 AAEA annual meetings.
Chaired the review process for the "Teaching, Extension and Professional Affairs" section of the AAEA selected papers, 1989.
Reviewed submissions for the Distinguished Contributions Award for Extension Programs for the SAEA, 1991-1994.
Served on the CSRS USDA review team for Auburn University Agricultural Economics Department, 1991.
Reviewed submissions for the Food Distribution Research Society Applebaum Scholarship Award, 1991-1994.
Member, Task Force for Comprehensive Analysis of New Jersey's Wholesale Fruit and Vegetable Marketing System, 2002.
Member, Task Force on Florida Agricultural Trade, convened by U.S. Congressman Adam Putnam, 2002-.
Member, CSRS USDA review team for Auburn University Agricultural Economics Department, 2003.

Choice Retail Beef vs. Nebraska Direct



Data Source:
USDA - ERS/AMS