NEW ENGLAND FRUIT MEETINGS 2002-2003

PROCEEDINGS

ONE HUNDRED AND EIGHTH &
ONE HUNDRED AND NINTH
ANNUAL MEETINGS
MASSACHUSETTS FRUIT GROWERS'
ASSOCIATION, INC.

January 9 and 10, 2002
January 8 and 9, 2003

Volumes 108 & 109

Published by the
MASSACHUSETTS FRUIT GROWERS' ASSOCIATION, INC.
P.O. Box 9632, North Amherst, MA 01059-9632

New England Fruit Meetings

Massachusetts Fruit Growers' Association, Inc.
in cooperation with the
New England University Cooperative Extensions

Sturbridge Host Hotel & Conference Center

January 9-10, 2002
January 8-9, 2003

Cooperating Groups:

Connecticut Pomological Society
Maine State Pomological Society
Massachusetts Fruit Growers' Association
New Hampshire Fruit Growers Association
Rhode Island Fruit Growers' Association
Vermont Tree Fruit Growers' Association

Edited by William J. Bramlage

Massachusetts Fruit Growers' Association, Inc.
P.O. Box 9632
North Amherst, MA 01059-9632

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BY-LAWS (as modified January 8, 2003)
Massachusetts Fruit Growers' Association, Inc.

Article I - Name

The name of the organization shall be the Massachusetts Fruit Growers' Association, Incorporated.

Article II - Object

The object of the Association shall be to encourage the growing and marketing of fruits adapted to this climate and all pertaining thereto.

Article III - Membership

Section 1. Any person interested in fruit growing in Massachusetts may become an active member of the Association by paying the annual dues, due January 1st, for the ensuing calendar year.

Members of the professional staff of the University of Massachusetts and any other public servants of the fruit industry may become members of the Massachusetts Fruit Growers' Association in good standing without payment of dues by vote of the Board of Directors.

Section 2. Any association or society of fruit growers, in Massachusetts may affiliate not less than a majority of its members into active voting membership in the Massachusetts Fruit Growers' Association by paying such dues as the Board of Directors may designate. Such payment shall be due January 1st for the ensuing calendar year.

Section 3. Any member may be elected to honorary life-membership in the Association by vote of the Board of Directors. Honorary life-members shall be entitled to all privileges of membership and shall be exempt from payment of dues.

Section 4. Members in good standing shall receive a copy of the Association's annual report.

Section 5. Any individual interested in fruit growing in Massachusetts alternatively may become an associate member of the Association by paying annual dues, due January 1st, for the ensuing calendar year. The amount of these dues will be set by the Board of Directors at their Annual Fall Meeting, and shall be lower than the dues for active membership. Associate members shall receive a copy of the Association's annual report, but shall not have voting privileges at business meetings of the Association.

Article IV - Meetings

Section 1. The Association shall hold its annual meeting for the election of officers and the transaction of business at a time and place to be determined by the Board of Directors.

Section 2. The order of business to be observed at the annual meeting shall be as follows:

1. Determination of quorum.
2. Call to order and reading of minutes of previous meetings.
3. Reports of officers.
4. Reports of committees.

5. Unfinished business.
6. New business.
7. Election of officers.

Section 3. Other meetings may be held at the direction of the President or the Executive Committee.

Section 4. Notice of the time and place of each meeting of the Association shall be mailed to every member, postage prepaid, at his last known address at least ten days before the date of such meeting.

Section 5. Twenty-five members shall constitute a quorum for the transaction of business at any meeting of the Association, but a lesser number may meet, call to order and adjourn.

Article V - Officers

Section 1. The officers of the Association shall be a President, three Vice-Presidents, Secretary, Treasurer, Auditor and Board of Directors.

The President shall be chairman of the Board of Directors and of the Executive Committee.

The offices of Secretary and Treasurer may be held by one and the same person. With the approval of the Executive Committee, the Secretary may appoint or employ such assistants as are needed to conduct the affairs of the Secretary's Office.

The Secretary, Treasurer and all assistants appointed or employed by the Secretary shall receive such salary and reimbursement for expenses as may be determined by the Executive Committee.

The Treasurer shall be under bond in such sum as the Executive Committee may determine.

The President and Secretary shall be ex-officio members of all committees.

Section 2. Each year the President of the Association shall appoint a nominating committee, which shall submit to the Secretary on or before December 1st nominations for President, Vice-Presidents, Secretary, Treasurer, and Auditor, to serve for a term of one year.

Section 3. The Board of Directors shall consist of the President, Vice-Presidents, Secretary, Treasurer, Auditor, last ex-president of the Association, Chairman of the Horticultural Research Fund, and Presidents of affiliated organizations, ex-officio, and twelve Directors at large nominated in the following manner:

Each year the Nominating Committee shall submit to the Secretary on or before December 1st a list of six candidates for Directors at Large for a term of three years. The six candidates for Directors at Large so nominated shall be fruit growers. The Directors shall be nominated with due regard for the various kinds of fruit grown by the membership and the geographical distribution of fruit production within the state.

The President and Secretary, acting for the Board of Directors, may invite one member of the fruit growers' association from each of other five New England States, the Extension Fruit Specialists and the other members of the professional staff of the University of Massachusetts,

the Massachusetts Department of Agriculture, and the County Extension Services to attend the meetings of the Board of Directors and take part in its deliberations.

Section 4. Before each annual meeting the Secretary of the Association shall prepare ballots containing the names of all persons nominated for office by the Nominating Committee, with additional space in each category for writing in the names of any members of the Association nominated from the floor preceding the voting. Said ballots shall be used by the members in electing the officers, and shall carry directions for voting in the different categories and instructing the members to vote for not more than four names for Directors at Large for a three-year term, the four candidates for Directors at Large receiving the greatest number of votes to be declared elected.

Article VI - Finance Committee

The President, immediate past-President, Treasurer and one Director or former Director appointed by the President shall constitute the Finance Committee. The President will serve as Chairman of the Finance Committee.

Article VII - Executive Committee

The President, Vice-Presidents, Secretary, Treasurer and Auditor shall constitute the Executive Committee.

Article VIII - Duties of Officers

Section 1. The Presidents shall:

(a) Preside over all meetings of the Association, Board of Directors and Executive Committee.
(b) Appoint committees for various purposes.
(c) Perform all other duties pertaining to the office.

Section 2. In the absence of the President one of the Vice-Presidents shall perform the duties of that office.

Section 3. The Secretary shall:

(a) Keep a record of all meetings of the Association, Board of Directors and Executive Committee.
(b) Serve all notices required by the by-laws of the Association.
(c) Conduct correspondence.
(d) Keep a list of members of the Association.
(e) Collect dues and turn them over to the Treasurer.

Section 4. The Treasurer shall:

(a) Have charge of all moneys of the Association.
(b) Pay out money on bills approved by the President and Secretary.
(c) Make a written report of the Association's finances at the meetings of the Board of Directors and at the annual meeting of the Association.
(d) At the close of this term of office turn over all funds and records in his possession to his successor.

Section 5. The Auditor shall be entitled to examine all books, papers and vouchers at

any time, and shall make a written report at the annual meeting of the Association.

Section 6. The Board of Directors shall:

(a) Outline the policies and direct the work of the Association.
(b) Endeavor to increase the membership of the association.
(c) Meet twice a year, in the spring and fall, at the call of the President, for the purpose of planning the program for the annual meeting, preparing the annual report, and taking action on any other business or referring it to a meeting of the Association.
(d) Set the amount of the annual dues at its fall meeting.
(e) Special meetings of the Board may be called by the President.
(f) Twelve members shall constitute a quorum at any meeting of the Board.

Article IX - Duties of Finance Committee

The Finance Committee shall formulate a financial policy for the Association and draw up a budget of expenditures for consideration by the Board of Directors.

Article X - Duties of Executive Committee

The Executive committee shall:

(a) Represent and act for the Board of Directors when it is not in session.
(b) Fill vacancies in office occurring between annual meetings.
(c) Perform all other duties revolving upon it under these by-laws.

Article XI - Reserve Fund

The association shall maintain a reserve fund, which shall consist of such of the Association's funds as the Board of Directors may designate. Principal and income from said fund may be expended by vote of the Board of Directors.

Article XII - Fiscal Year

The fiscal year of the Association shall commence December 1st and end on the 30th day of the following November.

Article XIII - Amendments

These by-laws may be amended at any meeting of the Association by two-thirds vote of the members present and voting, notice of the proposed amendment having been included in the call for such meeting.

Officers and Directors for 2002

Massachusetts Fruit Growers' Association, Inc.

PRESIDENT

Timothy Smith	Shelburne

VICE PRESIDENTS

Ken Nicewicz	Bolton
Steve Ware	Bolton
Gordon Kimball	Lunenburg

SECRETARY/TREASURER

Wesley Autio	Pelham

AUDITOR

Robert Davis	Bolton

PAST PRESIDENT

William Broderick	Sterling

DIRECTORS REPRESENTING LOCAL ASSOCIATIONS

Essex County Fruit Growers Association

James O'Brien, Jr.	Peabody

DIRECTORS AT LARGE

Term expires in 2003

Gerard Bierne	Berlin
Franklyn Carlson	Harvard
Hamilton Lincoln, Jr.	North Brookfield
Maurice Tougas	Northborough

Term expires in 2004

David Bishop	Shelburne
William Fitzgerald	Methuen
Thomas Clark	Deerfield
Alex Dowse	Sherborn

Term expires in 2005

David Chandler	Sterling
Robert Tuttle	Warren
Richard Bartlett	Richmond
Mario Lanni	Lunenburg

Committees for 2002

Massachusetts Fruit Growers' Association, Inc.

Executive:	T. Smith (chair), K. Nicewicz, S. Ware, G. Kimball. R. Davis, W. Autio, and W. Broderick.
Program:	D. Greene (chair), executive committee
Legislative:	A. Dowse (chair), K. Nicewicz, M. Tougas, and D. Bishop
Finance:	T. Smith (chair), K. Nicewicz, S. Ware, G. Kimball. R. Davis, W. Autio, and W. Broderick.
Cider:	S. Ware (chair), T. Clark, D. Shearer, R. Bartlett, and F. Carlson
UMass Fruit Advisory:	F. Carlson (chair), R. Davis, J. D. Greene, and T. Smith
Nominations:	D. Chandler (chair), M. Lanni, and R. Tuttle
Harvest Labor:	R. Davis (chair), F. Carlson, W. Broderick, G. Bierne, and G. Kimball
Annual Meeting Facililties:	R. Smiley (chair)
Marketing, Publicity, & Promotion:	K Nicewicz (chair), H. Lincoln, Jr., R. Tuttle, W. Fitzgerald, and T. Clark

Officers and Directors for 2003

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Hamilton Lincoln, Jr.	North Brookfield
Maurice Tougas	Northborough

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Executive:	T. Smith (chair), K. Nicewicz, S. Ware, G. Kimball. R. Davis, W. Autio, and W. Broderick.
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Cider:	S. Ware (chair), T. Clark, D. Shearer, R. Bartlett, and F. Carlson
UMass Fruit Advisory:	F. Carlson (chair), R. Davis, J. D. Greene, and T. Smith
Nominations:	D. Chandler (chair), M. Lanni, and R. Tuttle
Harvest Labor:	R. Davis (chair), F. Carlson, W. Broderick, G. Bierne, and G. Kimball
Annual Meeting Facililties:	R. Smiley (chair)
Marketing, Publicity, & Promotion:	K Nicewicz (chair), H. Lincoln, Jr., R. Tuttle, W. Fitzgerald, and T. Clark

Minutes
Meeting of the Board of Directors
Massachusetts Fruit Growers' Association, Inc.
Old Mill Restaurant, Westminster, Massachusetts
April 4, 2001

The meeting was called to order by President Broderick at 2:10 PM. Individuals present were Wes Autio, Rick Bartlett, Bill Broderick, Frank Carlson, David Chandler, Jon Clements, Bob Davis, Bill Fitzgerald, Kip Graham, Gordon Kimball, Mario Lani, Ken Nicewicz, Ned O'Neil, Bob Smiley, Tim Smith, Mo Tougas, Bob Tuttle, and Steve Ware.

Secretary's Report

Autio presented the minutes of the December 6, 2000 Directors' Meeting. Minutes were moved, seconded, and passed.

Treasurer's Report

Autio presented the Treasurer's Report. The General Fund began 2001 with a balance of $27,156.69. With $24,567.83 in receipts and $24,939.44 in disbursements so far in 2001, the balance on April 4 was $26,785.08. The Horticultural Research Fund began 2001 with a balance of $426,015.72. A total of $5,102.37 was recieved in donations and interest and $5,458.00 was disbursed on projects to date in 2001. With changes in investment value, the balance on April 4 is $427,676.77. To date this year, the fund has increased in value by 0.4%. The Treasurer's Report was moved, seconded and passed.

2001 New England Fruit Meetings & Trade Show

Autio reported that Greene requests ideas for the 2002 program. Smiley reported that there were 60 paid exhibitors in 82 booths in 2001. This was an increase of two exhibitors and four booths over 2000. The number of potential exhibitors continues to decline through consolidations, especially in the agricultural chemical businesses and with the loss of individually operated firms.

Motion: It was moved, seconded, and passed to instruct the secretary to investigate the possibility of combining the New England Fruit Meetings with the Vegetable and Berry Growers Conference.

Motion: It was moved, seconded, and passed to charge $10 per person per day for full members of MFGA and for all others $20 per person per day for registration at the 2002 New England Fruit Meetings & Trade Show.

Autio presented the financial details of the 2001 Meetings.

Receipts		
Exhibitors	$25,361.00	
Registration	4,800.00	$30,161.00
Disbursements		
Registration desk	$636.75	
Booth equipment	2,451.00	
Facilities (+electrical, social, AV, hospitality)	6,612.54	
Insurance	788.00	
Program Chairman	1,000.00	
Speakers	3,457.50	
Trade Show Manager expenses	1,601.15	
Trade Show Manager honorarium	2,500.00	
Exhibitor Buyers Guide	177.50	
Program	464.89	
Apples	152.00	
Badges	73.00	
Planning meeting facility	73.10	($19,987.43)
Apparent surplus		**$10,173.57**

Old Business

Reports were received by the Directors from the Trustees of the Horticultural Research Fund, the Legislative Committee, the UMass Fruit Advisory Committee, the Harvest Labor Committee, and the Marketing Committee. It was announced that Steve Ware has become chair of the Cider Committee.

New Business

Autio presented a proposed budget for 2001. Discussion ensued regarding future expenses. Ned O'Neil discussed the USAA dues increase of $0.004 to $0.008 over 4 years.

Motion: It was moved, seconded, and passed to allocate $1,000 to Jon Clement's European trip.

Motion: It was moved, seconded, and passed to eliminate paper publishing of the Proceedings, relying completely on a web-based electronic format.

Motion: It was moved, seconded, and passed to continue to support USAA but also to make it clear that we are uncomfortable with the increases.

Motion: It was moved, seconded, and passed to suspend funding for the New England Tree Fruit Growers Research Committee.

Motion: It was moved, seconded, and passed to accept the budget as amended in by the previous motions.

General Fund Budget -- 2001

	Budget 1999	Actual 1999	Budget 2000	Actual 2000	Budget 2001
Beginning balance	$3,732.05	$3,732.05	$9,243.18	$9,243.18	$9,571.68
Receipts					
Interest	$120.00	$100.23	$50.00	$29.73	$400.00
Membership	$12,000.00	$11,900.00	$12,000.00	$11,425.00	$11,000.00
Ads	$500.00	$350.00	$350.00	$0.00	$0.00
Fruit Meeting	$12,320.00	$12,242.39	$8,750.00	$8,652.62	$10,173.57
Apple Market Report	$450.00	$494.00	$450.00	$461.43	$450.00
Proceedings	$35.00	$140.00	$70.00	$70.00	$70.00
Cider	$2,000.00	$694.00	$1,000.00	$710.00	$500.00
Summer Meeting	$0.00	$390.00	$300.00	$493.00	$400.00
Miscellaneous	$0.00	$103.00	$0.00	$40.00	$0.00
Total	$27,425.00	$26,413.62	$22,970.00	$21,881.78	$22,993.57
Disbursements					
Administration	$2,500.00	$2,361.79	$2,500.00	$1,801.04	$2,200.00
Proceedings	$6,000.00	$1,000.00	$9,400.00	$4,108.35	$5,800.00
Secretary/Treasurer salary	$2,300.00	$2,124.04	$2,300.00	$2,124.04	$2,300.00
Affiliation	$400.00	$180.00	$400.00	$730.00	$400.00
Apple Market Report	$450.00	$0.00	$450.00	$0.00	$450.00
Horticultural Research Fund	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00
Cider	$3,000.00	$2,064.66	$1,000.00	$447.00	$500.00
U.S. Apple Association	$5,867.00	$5,867.00	$5,295.00	$5,295.00	$5,268.00
N.E. Tree Fruit Res. Comm.	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$0.00
Summer Meeting	$0.00	$390.00	$300.00	$447.85	$400.00
Miscellaneous	$500.00	$415.00	$500.00	$100.00	$2,200.00
Total	$(27,517.00)	$(20,902.49)	$(28,645.00)	$(21,553.28)	$(22,018.00)
Ending Balance	$3,640.05	$9,243.18	$3,568.18	$9,571.68	$10,547.25

The meeting was adjourned at 4:00 PM.

Respectfully submitted by
Wesley R. Autio, *Secretary*

Minutes
Meeting of the Board of Directors
Massachusetts Fruit Growers' Association, Inc.
Old Mill Restaurant, Westminster, Massachusetts
December 5, 2001

The meeting was called to order by President Broderick at 1:45 PM. Individuals present were Wes Autio, Rick Bartlett, Bill Broderick, Frank Carlson, David Chandler, Jon Clements, Bob Davis, Alex Dowse, Kip Graham, Mary Jordan, Tony Lincoln, Ken Nicewicz, Jamie O'Brien, Bob Smiley, Tim Smith, Bob Tuttle, and Steve Ware. Broderick gave words of welcome and introduced Mary Jordan and Kip Graham.

Secretary's Report

Autio presented the minutes of the April 4, 2001 Directors' Meeting. It was moved, seconded, and passed to accept the minutes as presented.

Treasurer's Report

Autio presented the Treasurer's Report. The General Fund began 2001 with a balance of $27,156.69. Receipts totaled $48,945.22, and disbursements totaled $45,123.79. The balance on December 5 was $30,978.12. The Horticultural Research Fund began the year with a balance of $426,015.72. A total of $2,500 was moved into the Horticultural Research Fund from the General Fund, $6,778 were received as donations, $693 were received from UMass Extension Twilight Meetings, $226.98 were received as interest, and $1,845 were received in memory of Walter Carlson. In total, $11,385.65 were expended on grants, $11,606 were returned to a donor, and $1 was expended on fees. The balance in the Horticultural Research Fund on December 5 was $406,376.56. Over the year to date, the Horticultural Research Fund lost 4.6% of its value. The Treasurer's Report was moved, seconded and passed.

Committee Reports

Autio reported for the Trustees of the Horticultural Research Fund and for the Program Committee. Smiley reported on the Meeting Facilities. Specifically, he reported that there were 74 booth spaces rented and that increasing consolidation of support industries continues to reduce the number of potential exhibitors. Ware reported on Cider, Carlson reported and the UMass Fruit Advisory Committee, Davis reported on Labor, and Nicewicz reported on Marketing, Publicity, & Promotion. Dowse announced that he was elected president of Mass. Farm Bureau and requested that someone else represent MFGA on Farm Bureau's Legislative Committee.

Motion: It was moved, seconded, and passed to allocate $150 to support Ag Day at the Statehouse.

Other Business

Jordan reported on activities of the Massachusetts Department of Food & Agriculture, and Graham reported on FSA. Clements updated the group on the MFGA website.

The meeting was adjourned at 3:20 PM.

Respectfully submitted by
Wesley R. Autio, *Secretary*

Minutes
Annual Business Meeting
Massachusetts Fruit Growers' Association, Inc.
Sturbridge Host Hotel, Sturbridge, Massachusetts
January 9, 2002

The Annual Business Meeting was called to order at 12:25 AM by President William Broderick. President Broderick offered words of welcome to the membership. Twenty-seven individuals were present.

Secretary's Report

Autio presented the minutes of the 2000 Annual Business Meeting. It was moved, seconded, and passed to accept the minutes as presented. The Annual Business Meeting of the Massachusetts Fruit Growers' Association, Inc. was held on January 10, 2001. Twenty-one members attended. Directors met on April 4 and December 5, the Executive Committee met on June 8, and the Trustees of the Horticultural Research Fund met on March 2 and August 28. The Annual Summer Meeting was on July 19 at the Sunny Crest Orchards in Sterling. Approximately 100 individuals attended the meeting.

One-hundred and eighty-nine individuals were members of the Association in 2001, a slight increase from 2000. Below are the membership figures for 1995-2001.

Category	1995	1996	1997	1998	1999	2000	2001
Active members	52	51	47	45	45	43	42
Associate members	58	73	62	59	56	60	65
Exhibitor members	67	72	69	56	62	57	60
Courtesy members	18	16	15	15	15	14	16
Life members	8	8	7	7	7	7	6
Total	203	220	200	182	185	181	189

It was moved, seconded, and passed to accept the Secretary's Report.

Treasurer's Report

The General Fund began the year with a balance of $27,156.69. Receipts totaled $52,361.44, and disbursements totaled $46,032.32. The balance on December 31 was $33,485.81. The Horticultural Research Fund began the year with a balance of $426,015.72. A total of $2,500 was moved into the Horticultural Research Fund from the General Fund, $6,778 were received as donations, $693 were received from UMass Extension Twilight Meetings, $240.28 were received as interest, and $1,845 were received in memory of Walter Carlson. In total, $11,385.65 were expended on grants, $11,606 were returned to a donor, and $1 was expended on fees. The balance on December 31 was $413,199.98. Over the year, the Horticultural Research Fund lost 3.0% of its value.

Detailed General Fund and Horticultural Research Fund information follow.

GENERAL FUND

Balance -- Fleet Bank, 12/31/00			$27,156.69
Receipts			
	Active member dues -- 2001	$8,400.00	
	Associate member dues -- 2001	$1,625.00	
	Exhibitor member dues – 2001	$425.00	
	Exhibitor member dues – 2002	$1,050.00	
	Annual meeting – 2001	$6,450.00	
	Annual meeting registration fee -- 2001	$4,800.00	
	Annual meeting – 2002	$20,599.00	
	Summer meeting	$390.00	
	Subscriptions	$55.00	
	Cider	$450.00	
	Galaxy Fund interest	$534.94	
	Web page grant	$1,000.00	
	Apple Market Report	$354.50	
	Horticultural Research Fund donations	$778.00	
	Fruit Notes & Healthy Fruit	$3,920.00	
	Horticultural Research Center donations	$920.00	
	IPM donations	$610.00	$52,361.44
Disbursements			
	Administration	$2,654.26	
	Secretary/Treasurer salary	$2,124.04	
	Annual meeting – 2001	$18,791.14	
	Annual meeting – 2002	$1,467.71	
	Proceedings – 2000	$5,374.17	
	Cider	$100.00	
	Web page	$360.00	
	Subscription refund	$35.00	
	Affiliations	$130.00	
	US Apple Association	$5,268.00	
	Clement's European trip	$1,000.00	
	Transfer to Horticultural Research Fund	$3,278.00	
	Fruit Notes & Healthy Fruit	$3,920.00	
	Horticultural Research Center Donations	$920.00	
	IPM Donations	$610.00	$(46,032.32)
Balance -- Fleet Bank + Galaxy Fund, 12/31/01			$33,485.81

HORTICULTURAL RESEARCH FUND

Balance -- Fleet Bank, 12/31/00		$11,867.53
Receipts		
Sincuk Fund	$6,000.00	
Twilight Meetings	$693.00	
Carlson Memorials	$1,845.00	
Tranfer from Merrill Lynch	$10,000.00	
Transfer from General Fund	$3,278.00	
Interest	$240.28	$22,056.28
Disbursements		
Sincuk Fund	$11,606.00	
Prokopy grants	$5,446.00	
Sincuk grants	$3,052.00	
Clements grants	$2,887.65	
Activity fee	$1.00	$(22,992.65)
Balance -- Fleet Bank, 12/31/01		$10,931.16

Balance -- Merrill Lynch, 12/31/00		$414,148.19
Cash -- 12/31/01		$151,422.00
Transfer to Fleet Bank account	$(10,000.00)	
Investments (value as of 12/31/01)		
AMLI Residential Properties	$5,044.00	
Chesapeake Energy	$19,830.00	
Exxon Mobil Corporation	$39,300.00	
General Electric	$40,080.00	
Philip Morris	$9,170.00	
Thornburg Mortgage, Inc.	$19,700.00	
Franklin Universal Trust	$12,240.00	
Liberty All-Star Equity Fund	$61,139.17	
Liberty All-Star Growth Fund	$10,254.23	
Royce Value Trust	$25,010.52	
Zweig Fund	$9,078.90	$250,846.82
Balance -- Merrill Lynch, 12/31/01		$402,268.82

Total Balance -- Horticultural Research Fund/Reserve Fund	**$413,199.98**
Overall change in value in 2001	-3.0%
Overall change not related to grant expenditures and deposits	-2.7%
Approved expenditures for operation of the Horticultural Research Center	$17,459.43

It was moved, seconded, and passed to accept the Treasurer's Report. Davis, after auditing the 2001 data, reported that the Treasurer's Report was accurate as presented. It was moved, seconded, and passed to accept the Auditor's Report.

Committee Reports

Davis reported on Harvest Labor, and Nicewicz reported on Marketing, Publicity, and Promotion. Discussion ensued regarding Federal money being granted by the Mass. Department of Food & Agriculture to support specialty crops. Proposals were discussed, and the following actions were taken:

Motion: It was moved, seconded, and passed to support a proposal presented by Jon Clements to acquire specialty crop moneys to develop and implement a marketing plan for the Massachusetts Fruit Growers' Association, Inc.

Motion: It was moved, seconded, and passed to support a proposal being developed by Charlie Touchette.

Motion: It was moved, seconded, and passed to support a proposal presented by Ron Prokopy to study plum curculio.

Motion: It was moved, seconded, and passed to give the President the power on behalf of the Massachusetts Fruit Growers' Association, Inc. to enter into contracts (including the authority to sign and execute said contracts) with the Massachusetts Department of Food & Agriculture regarding any of the above proposals, if funded.

Chandler read the slate of nominations from the Nominations Committee, including Tim Smith for President, Ken Nicewicz, Steve, Ware, and Gordon Kimball for Vice Presidents, Wes Autio for Secretary and Treasurer, Bob Davis for Auditor, and Rick Bartlett, Gerard Bierne, David Bishop, David Chandler, Mario Lanni, and Robert Tuttle for directors (six needed). No nominations were received from the floor, so it was moved, seconded, and passed to instruct the Secretary to cast a single ballot for the slate of candidates.

Respectfully submitted,
Wesley R. Autio, *Secreatry/Treasurer*

Minutes
Meeting of the Board of Directors
Massachusetts Fruit Growers' Association, Inc.
Old Mill Restaurant, Westminster, Massachusetts
March 20, 2002

The meeting was called to order by President Smith at 1:45 PM. Individuals present were Wes Autio, Rick Bartlett, Gerry Beirne, Bill Broderick, Frank Carlson, David Chandler, Tom Clark, Jon Clements, Alex Dowse, Bill Fitzgerald, Kip Graham, Duane Greene, Gordon Kimball, Tony Lincoln, Ken Nicewicz, Jamie O'Brien, Bob Smiley, Tim Smith, Jesse Stratton, Mo Tougas, and Steve Ware. Smith gave words of welcome.

Secretary's Report

Autio presented the minutes of the December 5, 2001 Directors' Meeting. It was moved, seconded, and passed to accept the minutes as presented.

Treasurer's Report

Autio presented the Treasurer's Report. The General Fund began 2002 with a balance of $33,485.81. Receipts to date totaled $26,184.15, and disbursements to date totaled $18,216.52. The balance on March 20, 2002 was $41,453.44. The Horticultural Research Fund began the year with a balance of $413,199.98. A total of $25.24 was received as interest on the savings account. In total, $1,853.28 were expended on grants. The balance in the Horticultural Research Fund on March 20, 2002 was $434,622.61. Over the year to date, the Horticultural Research Fund increased by 5.2%. The Treasurer's Report was moved, seconded and passed.

Committee Reports

Smiley reported that there were 60 paid exhibitors in 80 booths (the same as in the previous year and a decrease of 2 booths from 2000) at the 2002 New England Fruit Meetings & Trade Show. Greene asked all individuals to make suggestions for the Program at the 2003 meetings. Dowse and Nicewicz presented legislative concerns for the near future, including an announcement of Ag. Day at the Statehouse. Carlson and Ware presented potential changes in labor, and Nicewicz announced that the Specialty Crop Grant to support the develop of a marketing plan was approved for $40,000. Clements discussed the proposal.

Budget

Autio presented the 2002 proposed budget. Discussion ensued.

Motion: Add $1,000 to the budget to support the development of a logo for the Association. The motion was seconded and passed unanimously.

Motion: Add $2,500 to be given to the New England Tree Fruit Growers Research Committee. The motion was seconded and passed unanimously.

The amended budget (see below) was moved, seconded, and passed unanimously.

	Budget 1999	Actual 1999	Budget 2000	Actual 2000	Budget 2001	Actual 2001	Budget 2002
Beginning balance	$3,732.05	$3,732.05	$9,243.18	$9,243.18	$9,571.68	$9,571.68	$14,354.52
Receipts							
Interest	$120.00	$100.23	$50.00	$29.73	$400.00	$534.94	$500.00
Membership	$12,000.00	$11,900.00	$12,000.00	$11,425.00	$11,000.00	$11,500.00	$11,000.00
Ads	$500.00	$350.00	$350.00	$0.00	$0.00	$0.00	$0.00
Fruit Meeting	$12,320.00	$12,242.39	$8,750.00	$8,652.62	$10,173.57	$10,043.87	$15,300.00
Apple Market Report	$450.00	$494.00	$450.00	$461.43	$450.00	$354.50	$350.00
Proceedings	$35.00	$140.00	$70.00	$70.00	$70.00	$55.00	$0.00
Cider	$2,000.00	$694.00	$1,000.00	$710.00	$500.00	$450.00	$500.00
Summer Meeting	$0.00	$390.00	$300.00	$493.00	$400.00	$390.00	$400.00
Web page	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$0.00
Miscellaneous	$0.00	$103.00	$0.00	$40.00	$0.00	$0.00	$0.00
Total	$27,425.00	$26,413.62	$22,970.00	$21,881.78	$22,993.57	$24,328.31	$28,050.00
Disbursements							
Administration	$2,500.00	$2,185.83	$2,500.00	$1,625.08	$2,200.00	$2,478.30	$2,600.00
Proceedings	$6,000.00	$1,000.00	$9,400.00	$4,108.35	$5,800.00	$5,374.17	$2,000.00
Secretary/Treasurer salary	$2,300.00	$2,300.00	$2,300.00	$2,300.00	$2,300.00	$2,300.00	$2,600.00
Affiliation	$400.00	$180.00	$400.00	$730.00	$400.00	$130.00	$400.00
Apple Market Report	$450.00	$0.00	$450.00	$0.00	$450.00	$0.00	$350.00
Horticultural Research Fund	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$5,000.00
Cider	$3,000.00	$2,064.66	$1,000.00	$447.00	$500.00	$100.00	$3,500.00
U.S. Apple Association	$5,867.00	$5,867.00	$5,295.00	$5,295.00	$5,268.00	$5,268.00	$8,092.00
N.E. Tree Fruit Research Committee	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$0.00	$0.00	$2,500.00
Summer Meeting	$0.00	$390.00	$300.00	$447.85	$400.00	$0.00	$400.00
Web page	$0.00	$0.00	$0.00	$0.00	$1,000.00	$360.00	$1,640.00
Logo Development	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00
Miscellaneous	$500.00	$415.00	$500.00	$100.00	$1,200.00	$1,035.00	$1,000.00
Total	($27,517.00)	($20,902.49)	($28,645.00)	($21,553.28)	($22,018.00)	($19,545.47)	($31,082.00)
Ending Balance	$3,640.05	$9,243.18	$3,568.18	$9,571.68	$10,547.25	$14,354.52	$11,322.52

Other Business

Discussion ensued regarding the potential combination of the New England Fruit Meetings and the New England Vegetable & Berry Growers Convention. Smith will form a committee to begin discussions.

Lincoln questioned the dates of the Directors' meetings relative to the bylaws. Smith appointed a committee (Lincoln, Dowse, & Beirne) to report back in December regarding potential changes to the bylaws.

At the previous meeting, the President was explicitly given the power to enter into contracts with the Massachusetts Department of Food & Agriculture regarding the Specialty Crops Grant Program. The potential for funding of Agro-environmental Technologies grants was discussed.

Motion: It was moved, seconded, and passed to give the President the power on behalf of the Massachusetts Fruit Growers' Association, Inc. to enter into contracts (including the authority to sign and execute said contracts) with the Massachusetts Department of Food & Agriculture. This authority would encompass all existing and potential grant programs.

The meeting was adjourned at 3:15 PM.

Respectfully submitted by
Wesley R. Autio, *Secretary*

Minutes
Meeting of the Board of Directors
Massachusetts Fruit Growers' Association, Inc.
Old Mill Restaurant, Westminster, Massachusetts
Nobember 20, 2002

The meeting was called to order by President Smith at 2:00 PM. Individuals present were Wes Autio, Rick Bartlett, Gerry Beirne, Bill Broderick, Frank Carlson, David Chandler, Tom Clark, Jon Clements, Alex Dowse, Bill Fitzgerald, Kip Graham, Duane Greene, Gordon Kimball, Tony Lincoln, Ken Nicewicz, Jamie O'Brien, Bob Smiley, Tim Smith, Jesse Stratton, Mo Tougas, and Steve Ware. Smith gave words of welcome.

Secretary's Report

Autio presented the minutes of the March 20, 2002 Directors' Meeting. It was moved, seconded, and passed to accept the minutes with modification. Autio reported that the Executive Committee met on June 6 and July 10. Trustees of the Horticultural Research Fund met on April 18. The annual summer meeting was held on July 10 at the University of Massachusetts Cold Spring Orchard Research & Education Center. Approximately 100 individuals were in attendance. One hundred and ninety-six individuals were members of the Association in 2002, an increase of seven from 2001.

Treasurer's Report

The General Fund began the year with a balance of $33,485.81. Receipts totaled $124,505.45, and disbursements totaled $85,575.30. The balance on November 20, 2002 was $72,415.96. The Horticultural Research Fund began the year with a balance of $413,199.98. A total of $5,665.00 was moved into the Horticultural Research Fund from the General Fund, $9,625.00 were received as general donations, $3,485.00 were received as memorial gifts, and $102.81 were received as interest. In total $16,613.08 were expended on grants. The balance on November 20, 2002 was $352,886.18. So far in 2002, the Horticultural Research Fund has lost 14.6% of its value. The Treasurer's Report was moved, seconded and passed.

Committee Reports

Trustees of the Horticultural Research Fund and Program, Annual Meeting Facilities, Legislative, Cider, UMass Fruit Advisory, Harvest Labor, and Marketing committees reported. Much discussion ensued.

Old Business

Lincoln and Dowse presented proposed bylaw changes to be moved at the Annual Business Meeting.

Motion: Present proposal to the membership in writing and present the proposal at the Annual Business Meeting for a vote in January. The motion was seconded and passed with one opposed.

Clements updated the directors on the Marketing Specialty Crops Grant, and Smith discussed Sonia Schloemann's Agro-environmental Technologies Grant with *Ribes*.

Motion: Continue support of Schloemann's project. The motion was seconded and passed unanimously.

New Business

Smith proposed that the Summer Meeting in 2003, which is scheduled to be at his farm, be held in conjunction with New England Fruit Consultants. The proposal was approved by concensus.

The meeting was adjourned at 3:30 PM.

Respectfully submitted by
Wesley R. Autio, *Secretary*

Minutes
Annual Business Meeting
Massachusetts Fruit Growers' Association, Inc.
Sturbridge Host Hotel, Sturbridge, Massachusetts
January 8, 2003

The Annual Business Meeting was called to order at 12:15 AM by President Timothy Smith. President Broderick offered words of welcome to the membership. Twenty-four individuals were present.

Secretary's Report

Autio presented the minutes of the 2002 Annual Business Meeting. It was moved, seconded, and passed to accept the minutes as presented. The Annual Business Meeting of the Massachusetts Fruit Growers' Association, Inc. was held on January 9, 2002. Twenty-seven members attended. Directors met on March 20 and November 20, the Executive Committee met on June 6 and July 10, and the Trustees of the Horticultural Research Fund met on April 18. The Annual Summer Meeting was on July 10 at the University of Massachusetts Cold Spring Orchard Research & Education Center. Approximately 100 individuals attended the meeting.

One-hundred and ninety-six individuals were members of the Association in 2002, an increase from 2001. Below are the membership figures for 1995-2002.

Category	1995	1996	1997	1998	1999	2000	2001	2002
Active members	52	51	47	45	45	43	42	49
Associate members	58	73	62	59	56	60	65	73
Exhibitor members	67	72	69	56	62	57	60	59
Courtesy members	18	16	15	15	15	14	16	11
Life members	8	8	7	7	7	7	6	4
Total	203	220	200	182	185	181	189	196

It was moved, seconded, and passed to accept the Secretary's Report.

Treasurer's Report

The General Fund began the year with a balance of $33,485.81. Receipts totaled $129,190.25, and disbursements totaled $88,859.24. The balance on December 31, 2002 was $73,816.82. The Horticultural Research Fund began the year with a balance of $413,199.98. A total of $5,665.00 was moved into the Horticultural Research Fund from the General Fund, $9,625.00 were received as general donations, $3,485.00 were received as memorial gifts, and $131.11 were received as interest. In total, $16,613.08 were expended on grants. The balance on December 31, 2002 was $360,625.01. Details follow.

GENERAL FUND

Balance -- Fleet Bank + Galaxy Fund, 12/31/01			$33,485.81
Receipts			
	Active member dues -- 2002	$9,800.00	
	Associate member dues -- 2002	$1,825.00	
	Exhibitor member dues – 2002	$425.00	
	Exhibitor member dues – 2003	$825.00	
	Annual meeting – 2002	$6,487.00	
	Annual meeting registration fee -- 2002	$7,180.00	
	Annual meeting – 2003	$19,214.00	
	Summer meeting	$640.00	
	Subscriptions	$0.00	
	Cider	$390.00	
	Galaxy Fund interest	$313.15	
	Apple Market Report	$308.50	
	Horticultural Research Fund donations	$685.00	
	Specialty Crops Grant -- Clements	$40,375.10	
	Specialty Crops Grant -- Prokopy	$35,000.00	
	Agro-Environmental Tech. Grant -- Schloemann	$227.50	
	Fruit Notes & Healthy Fruit	$3,550.00	
	Horticultural Research Center donations	$1,305.00	
	IPM donations	$640.00	$129,190.25
Disbursements			
	Administration	$2,044.39	
	Secretary/Treasurer salary	$2,600.00	
	Annual meeting – 2002	$17,571.80	
	Annual meeting – 2003	$903.86	
	Proceedings – 2001/2	$0.00	
	Cider	$3,592.76	
	Web page	$500.00	
	Summer meeting	$1,134.90	
	Affiliations	$450.00	
	US Apple Association	$8,092.00	
	New England Tree Fruit Growers Res. Com.	$2,500.00	
	Transfer to Horticultural Research Fund	$5,685.00	
	Specialty Crops Grant -- Clements	$8,963.03	
	Specialty Crops Grant -- Prokopy	$27,840.50	
	Agro-Environmental Tech. Grant -- Schloemann	$927.50	
	Southwick Memorial	$100.00	
	Ag. Day at the Statehouse	$150.00	
	Apple Market Report	$308.50	
	Fruit Notes & Healthy Fruit	$3,550.00	
	Horticultural Research Center Donations	$1,305.00	
	IPM Donations	$640.00	$(88,859.24)
Balance -- Fleet Bank + Galaxy Fund, 12/31/02			$73,816.82

HORTICULTURAL RESEARCH FUND

Balance -- Fleet Bank, 12/31/01		$10,931.16
Receipts		
Sincuk Fund	$9,625.00	
From General Fund	$5,685.00	
Carlson Memorial	$100.00	
Lord Memorial	$2,470.00	
Southwick Memorial	$665.00	
Drake Memorial	$250.00	
Interest	$131.11	$18,926.11
Disbursements		
Sincuk Fund	$5,190.00	
Greene Grant	$6,037.00	
Prokopy Grant	$999.00	
Clements Grant	$1,444.80	
Leahy Grant	$2,512.00	
Schloemann Grant	$430.28	$(16,613.08)
Balance -- Fleet Bank, 12/31/02		$13,244.19
Balance -- Merrill Lynch, 12/31/01		$402,268.82
Cash -- 12/31/02		$94,680.00
Investments (value as of 12/31/02)		
AMLI Residential Properties	$4,256.00	
Chesapeake Energy	$23,220.00	
Consolidated Edison	$21,410.00	
Exxon Mobil Corporation	$34,940.00	
General Electric	$24,350.00	
Philip Morris	$8,106.00	
Puget Energy	$11,025.00	
Southern Company	$14,195.00	
Thornburg Mortgage	$20,100.00	
TXU Corporation	$9,340.00	
Franklin Universal Trust	$7,650.00	
Liberty All-Star Equity Fund	$38,505.36	
Liberty All-Star Growth Fund	$6,706.40	
Royce Value Trust	$23,267.00	
Zweig Fund	$5,630.06	$252,700.82
Balance -- Merrill Lynch, 12/31/02		$347,380.82
Total Balance -- Horticultural Research Fund/Reserve Fund		$360,625.01
Overall change in value in 2002		-12.7%
Overall change not related to grant expenditures and deposits		-13.3%
Approved expenditures for operation of the Horticultural Research Center		$30,744.43

It was moved, seconded, and passed to accept the Treasurer's Report. Davis, after auditing the 2002 data, reported that the Treasurer's Report was accurate as presented. It was moved, seconded, and passed to accept the Auditor's Report.

Committee Reports

Greene reported on Program, Dowse reported on Legislative, Ware reported on Cider, Carlson reported on UMass Fruit Advisory, and Davis reported on Harvest Labor and on the Trustees of the Horticultural Research Fund. Smith presented a slate of candidates for officers and directors, including Tim Smith for President, Ken Nicewicz, Steve, Ware, and Gordon Kimball for

Vice Presidents, Wes Autio for Secretary and Treasurer, Bob Davis for Auditor, and Gerard Bierne, Franklyn Carlson, Hamilton Lincoln, Jr., and Maurice Tougas for directors. No nominations were received from the floor, so it was moved, seconded, and passed to instruct the Secretary to cast a single ballot for the slate of candidates.

Bylaws

Dowse and Lincoln presented proposed bylaws changes, eliminating the specific meeting times. Directors' meetings are proposed to occur in fall and spring, and the Annual Business Meeting would be set by the Directors.

Motion: Amend the Bylaws of the Massachusetts Fruit Growers' Association, Inc. as presented. The motion was seconded and passed unanimously.

The meeting was adjourned at 12:45 PM.

Respectfully submitted,
Wesley R. Autio, *Secreatry/Treasurer*

ECONOMIC SIGNIFICANCE OF ORGANIC FRUIT PRODUCTION IN NEW ENGLAND, THE US, AND THE WORLD

M. Elena Garcia
Department of Plant and Soil Science
University of Vermont

Organic Production Worldwide

Organic farming in the United States, as well as throughout the world, is one area of agriculture that continues to expand and grow. In the past, organic foods used to fit into a niche found only in specialty shops. Today, organic foods are found in a variety of markets such as roadside stands, farmers markets, and conventional supermarkets. According to the Organic Trade Association, sales of organic foods and beverages have been increasing by at least 20% per year since 1990 with some years reporting up to 24% increases in the United States. These sales are often associated with more direct marketing and smaller farms.

According to a 2001 worldwide survey by a private research firm in Germany, Australia was the leading country in land managed as organic farming systems (19 million acres). Argentina and Italy followed with 6.9 and 2.6 million acres, respectively. The United States was fourth with 2.35 million acres under organic production. This acreage includes both crop and pasture land. Europe is the leading geographic area in organic crop production, where increases in production have been estimated to be five-fold between 1993 and 2000. One of the main reasons for this success, besides consumer demand, is the commitment by many European countries to support organic agriculture by encouraging research and education and consumer information in order to enlarge organic markets. In addition, many European countries provide some type of financial support to growers for changing their practices to an organic management system. For example, in Finland, conversion aid is paid for five years and the farmer receives EUR 60 per acre and year. For already converted areas, the aid is EUR 42 per acre and year and the contracts are made on a five-year basis. In 2001, Italy was the leading European country in both total share of organic fruit production (3 million acres) and total percentage (8%) in farmland under organic management.

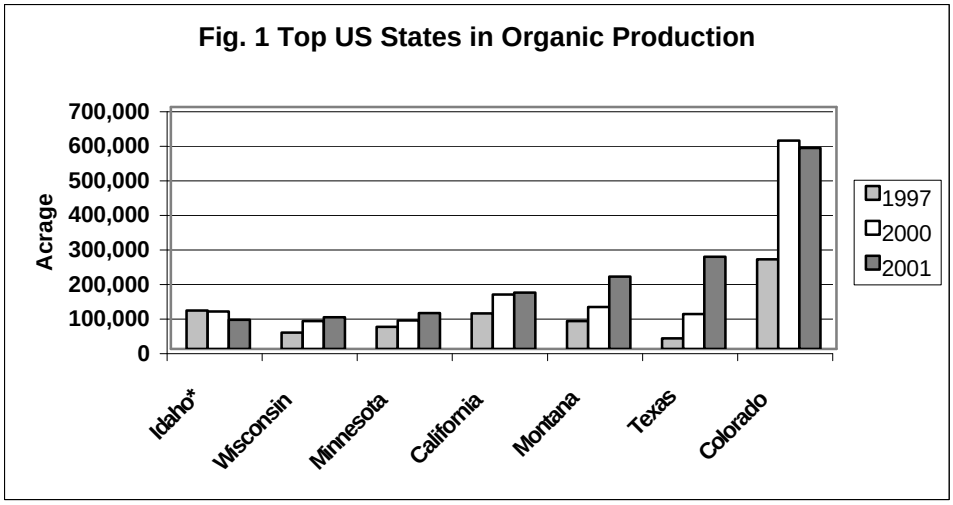
In October 2001, the U.S. Department of Agriculture put in place a set of national standards that label foods as "organic". According to these standards, organic agriculture is: “A production system that is managed in accordance to the Foods Production Act and regulations to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance and preserve biodiversity”. In the past, organic food producers established and followed their own regional, voluntary certification standards. The new regulations should help consumers buying organic foods because these regulations provide precise definitions and penalties for violations.

Organic Production in the U.S.

According to USDA statistics, U.S. certified organic cropland doubled between 1992 and 1997 (to 1.3 million acres) and preliminary estimates indicate that organic production increased significantly between 1997 and 2001. The leading state in organic production is Colorado, with

over half a million acres in production (both cropland and pasture included). Other leading states include Texas, Montana and California (Fig. 1).

In general, the South has less acreage under organic production than any other region in the U.S. The area in organic production in New England is approximately 44,000 acres, with Vermont leading with 39,000 acres.



According to various surveys, organic farmers market their food directly to consumers much more frequently than conventional farmers do. Vegetables and fruits are the commodities sold the most through direct markets. It is estimated that 20 percent of the organic fruit and vegetable acreage is marketed directly to grocery retailers and restaurants. The organic products most often purchased are tomatoes, leafy vegetables, carrots, and apples. The estimated dollar value in 2000 for fresh produce sales was $833 million, accounting for 42 percent of the U.S. organic food sales.

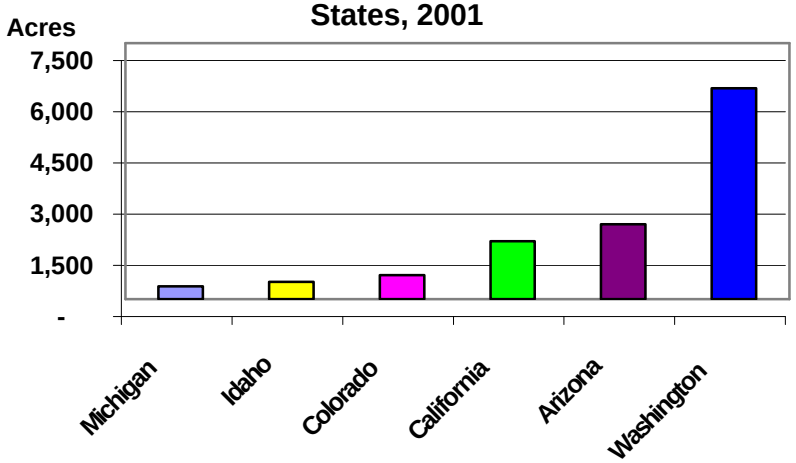
U.S. Organic Fruit Production

The United States leads the world production of organic apples, with an estimated production in organic apples at 17,276 acres. It is second in pear production with an estimated 2,798 acres in 2001. Most of this production is located in the semi-arid regions of the West, which have a major climatic advantage over more humid regions in the East. The Western region has fewer problems with pests (diseases and insects). In 2001, Washington State was the leading producer in organic apples, pears, and sweet cherries. In Washington, organic apple production in 2001 was approximately 6540 acres with another 3400 acres in transition. This figure represents only 3.9% of the total apple acreage in this state. Organic apple production in Washington State has generally increased every year in the past 10 years, with an increase of 55% from 2000 to 2001. Other states where apples are grown organically include Arizona, California and Colorado (Fig 2). The leading apple cultivar grown organically in Washington is 'Red Delicious'. The planting of other cultivars such as 'Granny Smith, 'Gala' and 'Fuji' nearly doubled in acreage from 2000 to 2001 (Table 1). Pear production in Washington State increased by 111% in 2001 from 2000, to 619 acres. The main pear cultivar under organic management is 'Anjou,' with 'Bosc' and 'Bartlett' also being planted but to a lesser degree. Increases in organic production of other fruits are expected in the future.

Table 1. Washington organic apple acreage by variety 2000-2001 (WSU *Current trends in organic tree fruit production*).

	2000			2001		
Variety	Certified	Transitional	Total	Certified	Transitional	Total
Red Del.	1512	984	2496	1872	864	2736
Granny Smith	452	625	1077	1053	651	1704
Gala	596	577	1173	1040	440	1481
Golden Del.	603	304	907	860	131	991
Fuji	425	606	1031	807	408	1215
Braeburn	186	165	351	258	177	435
Cameo	93	350	443	151	146	297
Pink Lady	83	196	279	128	532	660
Other	209	71	280	371	72	432
Total	4159	3878	8037	6540	3411	9951

Fig. 2. Leading U. S. Organic Apple Producing States, 2001



Generally, prices for organic fruits are higher than those of 'conventionally' managed fruits. However, organic prices are as susceptible to market fluctuation as are those for 'conventionally' grown fruits, and there has been a general decline in price premiums for organic fruits. For example, prices received for the older cultivar 'Red Delicious' grown organically are lower ($18.70/box over six cropping seasons) than those received for the newer cultivars such as 'Cameo' and 'Pink Lady' ($26.68 and $24.29 per box, respectively). One must consider that pricing is not the only factor determining whether an organic fruit producer will be successful or not. The cost of production may be higher for organic producers than for conventional growers. It is estimated that organic fruits require premiums of 12-14% higher than conventional prices to reach a break-even point.

In conclusion, the U.S. Organic Market is forecast to be worth $20 billion by the year 2005 with an annual growth rate of 21%. Although a slowdown is likely to occur as the market expands and matures, there are market opportunities for fruit growers in New England in this expanding area of agriculture.

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A *QUICKER* WAY TO DETERMINE SCAB RISK IN YOUR ORCHARD

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For a number of years, the 'delayed first-spray strategy' has been a scab management option for orchards with low levels of potential overwintering inoculum. There are a number of benefits to delaying the first fungicide spray for apple scab including: a reduction in the total number of fungicide sprays during the growing season and a subsequent reduction in spray cost and, possibly, a reduction in pressure for fungicide resistance; and less travel through the orchard in the early Spring when the ground is usually wet and prone to ruts. However, an assessment of the potential ascospore dose (PAD) or scab-risk of an orchard has to occur in the previous Autumn to determine if the orchard is a candidate for this strategy in the Spring. In the past, the assessment either involved calculating the PAD using a somewhat complicated formula or counting the number of scabbed leaves on 600 shoots in an orchard and comparing the result with an established threshold. Both methods involved a significant amount of time, which hindered their adoption. A better, less time-consuming method needed to be developed.

In 1999, based on historical research data of orchard assessments, a sequential sampling technique was proposed where as few as 100 shoots (10 shoots on each of 10 trees) would produce a risk assessment (MacHardy et al. 1999). A description of the sequential sampling technique to determine scab risk was included in the 2000-2001 New England Apple Pest Management Guide (NEAPMG) (Koehler 2000).

As described in the NEAPMG, the sequential sampling technique for trees approximately 9-13 ft tall on semi-dwarfing rootstock involves:

1. Selecting 10 trees dispersed throughout the entire orchard. For example, if there were 1000 trees, every 100^{th} tree would be examined.

2. On each tree, 10 extension shoots selected randomly from high, low, exterior, and interior parts of the tree canopy are examined. If sucker shoots are present, one sucker shoot should be selected.

3. On each shoot, the upper and lower surfaces of each leaf are examined and the number of scabbed leaves recorded. There are pictures in the NEAPMG of the types of spots that might be present in the Fall. When in doubt, call it a scab lesion and include the leaf in the total of scabbed leaves.

4. The number of scabbed leaves recorded on the 10 trees are totaled and then the chart in the NEAPMG (Fig. 1) is used to tell whether sampling can stop or whether an additional 10 trees will need to be sampled to determine the scab-risk rating of the orchard.

However, although the sequential sampling technique was developed based on years of historical assessment data, it had not been field validated in the orchard. Thus, a research project was designed to: (i) determine whether or not the outcome of the sequential sampling technique consistently agreed with the outcome of looking at 600 shoots, which was the previous method, to estimate the 'scab-risk' of an orchard; and (ii) determine how consistent the sequential sampling

technique is in identifying whether an orchard is a 'low-' or 'high-risk' orchard when different trees and shoots were chosen for sampling. The research was conducted by Jessica Reardon, a graduate student in the UVM Department of Plant & Soil Science, as part of her graduate studies (Reardon 2002).

Materials & Methods

In the Autumn of 1999, three orchards were assessed for scab-risk using the sequential sampling technique. After the initial 10 trees were sampled, 5 additional sets of 10 trees were sampled, whether or not the number of scabbed leaves indicated further sampling was needed according to the sequential sampling chart. Thus, in each orchard, 6 sets of 10 trees were examined for a total of 600 shoots, which was the number of shoots required for the older assessment method. The time it took to assess the sets of 10 trees was noted.

In the Autumn of 2000 and 2001, 15 orchards were assessed to determine their 'scab-risk' levels using the same sequential sampling technique except that 20 shoots were sampled from each tree. This gave additional shoots per tree to analyze whether or not choosing different shoots on a tree would make a difference in the scab-risk rating.

Results

In 1999, all 3 orchards that were evaluated were below the threshold of 5 scabbed leaves on the first 10 trees sampled; thus, the orchards were considered at 'low-risk' for apple scab the next season. Assessing 5 additional sets of 10 trees in two of the orchards produced the same 'risk' level. However, in the third orchard, if the third, fifth or sixth set of 10 trees had been the initial sampling set, the sequential sampling technique chart would have indicated further sampling of trees was necessary to determine the scab-risk rating.
Nevertheless, the total number of scabbed leaves on all 60 trees was below the threshold (i.e., 50 scabbed leaves), as it was in the other two orchards, which indicated the orchard was at 'low-risk'.

The sequential sampling technique, in which only 10 trees (i.e., 100 shoots) were sampled, required an average of 36 min, which was 3.63 hr less than the average of 4.23 hr that was needed to complete the older assessment method in which 60 trees (600 shoots) are sampled. ***Sequential sampling can potentially save 3.6 hours!!***

In 2000 and 2001, when each of the 6 sets of 10 trees in the 15 assessed orchards was evaluated as if each were the initial sampling set in the sequential sampling technique (the first set of 10 trees) and the number of scabbed leaves on each set of trees was compared to the thresholds illustrated in the sequential sampling chart, there were ***only 20 assessments out of a total of 180 assessments where sampling a single set of 10 trees did not result in a 'low-risk' or 'high-risk' rating*** -- in only 20 assessments would you have had to sample more than the initial set of 10 trees to obtain a scab-risk rating. However, when the numbers of scabbed leaves from sets of trees were added together, as they would be in the sequential sampling technique, a rating usually could be attained by adding only 1 or 2 additional sets of 10 trees,

In other words, ***in 160 out of the 180 assessments, the sampling stopped at the initial 10 trees (100 shoots) because the number of scabby leaves either indicated a high risk or a low risk.*** In only 20 assessments was the number of scabbed leaves above the threshold for 'low-risk' but below the threshold for 'high-risk', indicating sampling should 'continue'. But, again, a rating usually could be attained by adding only 1 or 2 additional sets of 10 trees.

There is the important question: ***Would we have gotten the same results if we used different combinations of trees and different shoots on those trees?*** Therefore, the 2000 and 2002 data were further analyzed by a computer simulation program (Reardon 2002). The program randomly selected a tree on which to begin the assessment from all of the 60 possible trees in the data set, then randomly selected 10 extension shoots from the total of 20 extension shoots on that tree. The program continued to randomly select trees and extension shoots until a total of 10 trees had been selected. Once a tree was selected by the program, it was taken out of the selection pool so that it could not be selected twice. The program then determined whether the first 10 trees were above or below threshold, or whether sampling had to continue, according to the sequential sampling technique. If it was determined that sampling had to continue, the process of selecting 10 random trees and 10 extension shoots from the remaining trees was repeated until a maximum of 60 trees had been sampled. This entire process was repeated 100 times per orchard, generating data on how many times an orchard was determined to be at 'low-risk' or at 'high-risk' and how many trees it took to get that rating.

The simulated, sequential sampling produced very consistent results within all orchards in both years. ***All 100 simulations within each orchard, using different trees and different shoot combinations, produced the same result: either all simulations generated a 'low-risk' rating or all generated a 'high-risk' rating.*** The simulated sequential sampling rating was always the same as the rating obtained by the initial sequential sampling conducted in the field and the same as using the 600 shoot method. However, not all simulations required only 1 set of 10 trees to determine 'scab-risk'. In some orchards, 20 to 30 trees were required in simulations and, in one orchard, 50 and 60 trees were required in 2 simulations, respectively, to produce a 'scab-risk' rating.

Conclusion

The Sequential Sampling Technique provided the same scab-risk ratings as the 600 shoot assessment method in significantly less time. It's Quicker !!

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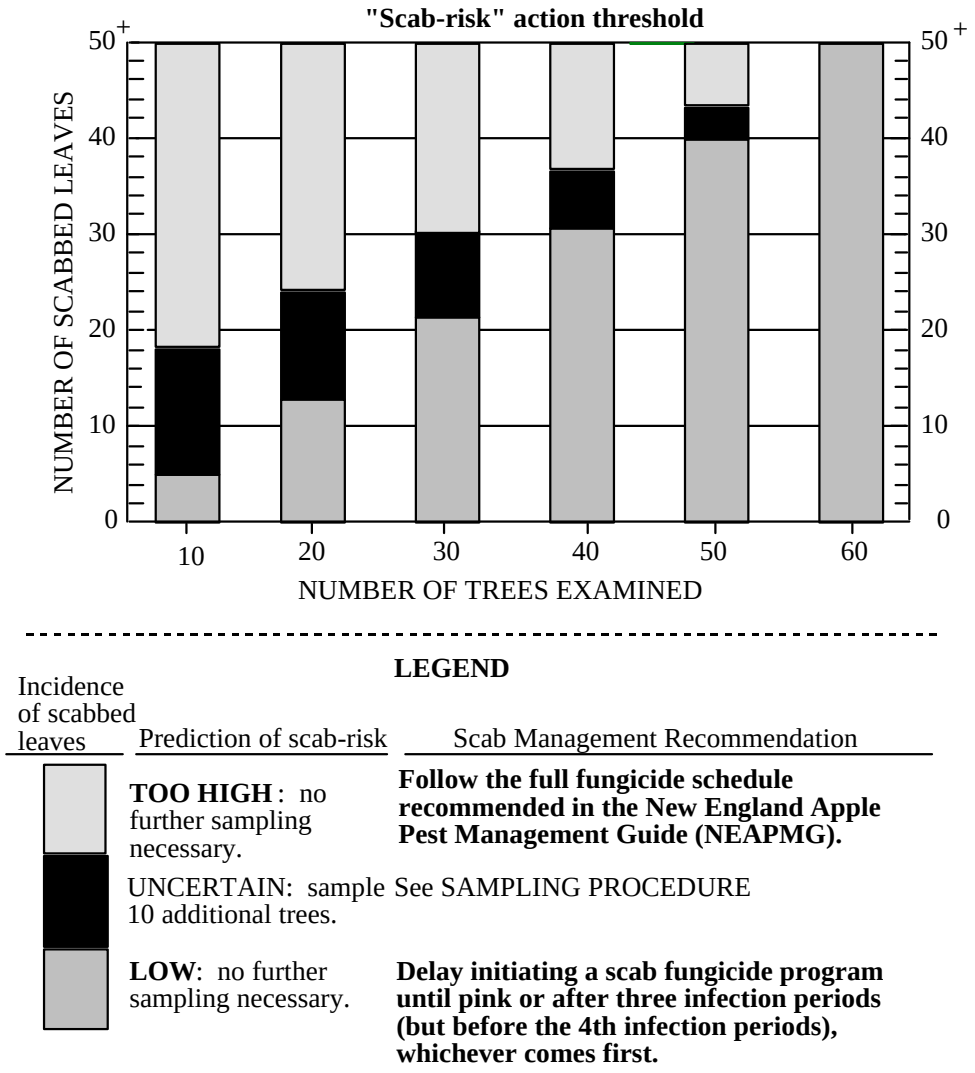
Figure 1. Sequential sampling chart in the 2000-2001 New England Apple Pest Management Guide describing 'scab-risk' thresholds based on the number of scabbed leaves for each set of 10 trees sampled.



DOES SURROUNDÒ HAVE NON-TARGET IMPACTS ON NEW ENGLAND ORCHARDS?

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The University of Vermont Apple Program received a USDA grant to study the long-term effects of "particle film technology" on Northeast apple orchards. This technology has been commercially available to growers since 2001 in the kaolin clay–based product Surround®. Surround® is viewed as a potential alternative for some organophosphate uses in orchards. It is considered a "Reduced Risk Pesticide" by the EPA, indicating that it has characteristics such as very low toxicity to humans and non-target organisms including fish and birds, and low risk of groundwater contamination or runoff. The material also meets all Federal and State standards for use in organic crop production, and may be an important component in that expanding field. Currently for apples Surround® is labeled for control of leafhoppers and overwintering oblique banded leafroller, and suppression of codling moth, plum curculio, apple maggot, green fruitworm, and a number of other insects.

When applied to the tree, Surround® forms a white physical barrier on the surface of fruit and foliage. This particle film barrier acts as a pest deterrent by either directly repelling insects or making feeding, egglaying, or colonization sites unrecognizable or unsuitable. By its nature, this technology is extremely dependent on thorough coverage of the fruit and foliage. Dilute or near dilute applications are necessary and application rates can range from 25 to 50 pounds per acre on apples.

The current material label states that "When applied at recommended rates and frequencies, benefits such as increased plant vigor and improved yields may occur in certain apple cultivars. Under high ambient temperatures, Surround® reduces canopy temperature and, therefore, can help to reduce heat and water stress. Many cultivars have shown improved fruit color, smoothness, and size with less sunburn, and cracking when Surround® is used." However, much of the previous research on these variables has been performed in warmer, semi-arid, and sub-humid environments.

Application of Surround® at full rates has been suggested to reduce canopy temperature due to reflectance of solar energy from the white film. The objectives of our research are to determine potential non-target effects of thorough coverage of kaolin film on apple tree vigor, productivity, and fruit quality, including an economic assessment of the gross monetary value of the crop, and to determine non-target effects of kaolin film on diseases and bird damage (we are referring to these effects as 'non-target' because kaolin films have been developed and subsequently labeled primarily to manage insect pests) under the relatively cool and moist climate of the Northeast.

Materials & Methods

The research is being conducted at the UVM Horticultural Research Center in South Burlington, VT on 'McIntosh' trees on M.26 rootstock planted in 1988. In 2001, preliminary data were collected. The study officially began in 2002 and continues through the 2004 growing season.

The experiment uses a completely randomized design with five treatments replicated six times. Each replicate consists of single tree plots of 'McIntosh' with four treated guard trees. Treatments include:

1) Surround® beginning at green tip plus fungicides.
2) Surround® beginning at green tip without fungicides.
3) Surround® beginning at petal fall plus fungicides.
4) Standard IPM.
5) Nontreated control. In 2001 this treatment received fungicides. For 2002 and beyond the protocol was amended to remove fungicides treatments.

Fungicides used include mancozeb pre-bloom and captan post-bloom, applied as needed according to weather and disease cycle monitoring. The insecticide used for the IPM treatment was Imidan applied as monitoring dictated. Surround® sprays were applied weekly through first cover, then bi-weekly through mid-August. Treatment sprays were applied near-dilute with a handgun at 100 psi in 100 gallons of water per acre. All treatments received standard horticultural sprays including foliar nutrients and thinning sprays as determined by crop load monitoring. Thinners used include Sevin XL at 1 quart per acre and NAA as needed. Two percent prebloom oil was applied to the entire block. Whole block oil, thinner, and nutrient sprays were applied via airblast sprayer. Surround® rate varied with the previous spray's coverage, from 25 to 50 pounds per 100 dilute gallons per acre. Imidan, mancozeb, and captan were applied at standard labeled rates.

In this comprehensive study, data on numerous variables within the block are being collected. These include fruit quality and appearance characteristics (fruit weight, color, firmness, soluble solids, and incidence of bitter pit, sunburn, and russeting), and tree data (spur characteristics, bloom density, leaf density, foliar nutrient analysis, defoliation rate, harvested yield, and preharvest drop). In addition, arthropod pest incidence and damage on fruit and foliage and disease incidence are being assessed along with bird peck damage at harvest. Since the results presented here are preliminary, we have chosen to report only on those variables of the experiment that evaluate general horticultural characteristics.

Fruit quality measurements. A random sample of 30 fruit in 2001 and 2002 was collected from each tree and evaluated for weight (g), skin color (visual estimate of % red blush), and percent russet covering fruit surface (a value of zero indicated no russet; one, 5% or less of the fruit surface covered; two, 5-25%; three, 26-50%; four, 51-75%; and five, over 76 %).

Yield. Yield efficiency (kg/TCA) was measured by weighing all the fruit on the tree, and dividing by the tree's trunk cross-sectional area. Pre-harvest drop (kg/TCA) was measured by collecting and weighing all the fruit on the ground before harvest and dividing it by the TCA.

Tree vigor. Spur diameter (mm) of five fruiting spurs per tree diameter of the next year's fruiting buds was measured for ten buds per tree in October. Specific leaf weight (dg. dry weight/square cm. leaf area) was assessed by measuring the mass and area of 25 fruit spur leaves per tree in August

Bird-peck damage. In both years, fruit with bird pecks in both dropped and harvested fruit were counted.

Results

Fruit quality. Fruit weight: In both 2001 and 2002, in plots where Surround® and fungicides were used (treatments 1 and 3), fruit size was significantly greater than the IPM standard (Table 1). The data were taken from observations made on 600 fruit samples (when available) per treatment. Satisfactory red fruit color was achieved in all treatments in both test years Where Surround® was applied without fungicides (treatment 2), color was consistently the best. This may be due to the increased ethylene production in the scabby fruit in that treatment. Where fungicides were applied, we consistently saw an increase in red color development in the Surround® treated fruit (treatments 1 and 3) (Table 1). While these increases were found to be significant statistically, it is important to also look at the magnitude of the increase. In 2001 the IPM fruit (treatment 4) had an average red color of 58% while the Surround® and fungicide treated fruit (treatments 1 and 3) had 61% red color. The increase between these treatments in 2002 was numerically greater, with 62% red color in the IPM treatment versus 66 and 68 percent in the Surround® treatments. While the increase in red color may be small it has been consistent to date and may be of importance at packout. Fruit russet at packout was evaluated in both years. For each fruit a value of zero to five was assigned according to percent of fruit surface with russet. For both years there were fairly low russet values, although the presence of frost rings in 2002 was indicated by the relatively higher values in that year (Table 1). Since 'McIntosh' is not known for having russet problems, work on more russet-prone varieties may shed some more light on any effect Surround® might have on fruit finish. Based on research to date, it does not appear that Surround® *increases* russeting on 'McIntosh' under our growing conditions.

Table 1. The effects of Surround® application on fruit weight (g), percent red color, and mean russet on 'McIntosh'/M.26 in 2001and 2002.

	Fruit weight (g)		% Red color		Mean russet	
Treatment	2001	2002	2001	2002	2001	2002
1- Sur GT + Fung	200 A[z]	173 A[z]	61 B[z]	66 C[z]	0.11 A[z]	0.34 B[z]
2- Sur GT no Fung	172 C	160 C	67 A	76 A	0.07 C	0.20 C
3- Sur PF + Fung	200 A	166 B	61 B	68 B	0.07BC	0.41 AB
4- IPM	188 B	158 C	58 C	62 E	0.14 A	0.50A
5- NTC	189 B	128 D	61 B	64 D	0.11AB	0.49 A

[z]Means within a column with the same letter are not significantly different (Fisher's Protected LSD test, P<0.05)

Yield. Yield efficiency: No statistical difference between treatments in the 2001 season was found. Data from 2002 however indicate Surround® treated plots where fungicides were also used had similar or better yield efficiency over the IPM standard (Table 2). If Surround® application helps to reduce heat and water stress on trees, one might expect that pre-harvest drop would also be reduced. In 2001 the IPM standard (treatment 4) had less drop than all other treatments but the difference was not statistically significant (Table 2). The 2002 data provided similar results but the difference was statistically significant between the IPM standard and all other treatments.

Table 2. The effects of Surround® application on yield efficiency and fruit drop on 'McIntosh'/M.26 in 2001and 2002.				
	Yield efficiency (kg/TCA[z])		Number of dropped fruit / TCA	
Treatment	2001	2002	2001	2002
1- Sur GT + Fung	0.72 A[y]	0.59 AB[y]	1.41 A[y]	1.38 A[y]
2- Sur GT no Fung	0.47 A	0.41 BC	1.25 A	1.38 A
3- Sur PF + Fung	0.71 A	0.71 A	1.59 A	1.71 A
4- IPM	0.71 A	0.59 AB	1.02 A	0.53 B
5- NTC	0.65 A	0.32 C	1.51 A	1.34 A
[z] TCA = trunk cross-sectional area [y]Means within a column with the same letter are not significantly different (Fisher's Protected LSD test, P<0.05)				

Tree Vigor. There were no significant differences in spur diameter between the treatments in 2001 or 2002 (Table 3). Spur leaf density showed differences in 2001, where the Surround® treated leaves (treatments 1,2, and 3) were less dense than IPM or nontreated leaves (treatments 4 and 5). Data the following year did not replicate these results and showed no difference between treatments (Table 3). Analysis of these indirect measurements of photosynthesis will become more important as the trees receive the treatments over multiple seasons and the results can be analyzed together. At this point no conclusions can be made whether or not Surround® treatments measurably affect tree vigor.

Table 3. The effects of Surround® application on 'McIntosh'/M.26 on spur bud diameter and spur leaf density during 2001and 2002.				
	Spur Diameter (mm)		Leaf density (dg/cm2)	
Treatment	2001	2002	2001	2002
1- Sur GT + Fung	4.1 A[z]	4.4 A[z]	0.127 BC[z]	0.115 A[z]
2- Sur GT no Fung	3.9 A	4.3 A	0.127 BC	0.121 A
3- Sur PF + Fung	4.1 A	4.1 A	0.121 C	0.119 A
4- IPM	4.1 A	4.2 A	0.139 AB	0.116 A
5- NTC	4.3 A	4.3 A	0.135 A	0.120 A
[z] Means within a column with the same letter are not significantly different (Fisher's Protected LSD test, P<0.05)				

Bird peck damage. Bird damage on harvested fruit was minimal, with seven pecked fruit harvested between both years. Dropped fruit showed more damage (Table 4), where pecked fruit ranged from 0.7 to 5 per cent of the total, with no statistical separation between the treatments in either year.

Conclusions

The data represent only preliminary results from a multi-year study, which will continue for the next two growing seasons. Documenting any horticultural impacts will require looking at

repeated applications of Surround® to the same trees over a period of years. Conclusions will be made after analyzing the study's full data set through repeated measures analysis.

Table 4. The effects of Surround® application on 'McIntosh'/M.26 on bird peck damage on dropped fruit during 2001and 2002.

	% Bird Pecked Damage	
Treatment	2001	2002
1- Sur GT + Fung	4.3 A [z]	3.5 A [z]
2- Sur GT no Fung	4.7 A	0.7 A
3- Sur PF + Fung	3.8 A	2.2 A
4- IPM	2.8 A	1.2 A
5- NTC	5.0 A	2.3 A

[z] Means within a column with the same letter are not significantly different (Fisher's Protected LSD test, $P<0.05$)

FQPA – ORGANOPHOSPHATE TIMELINE

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Revised Cumulative Risk Assessment

FQPA requires that EPA, when setting pesticide tolerances, take into account "available evidence concerning the cumulative effects of such residues and other substances that have a common mechanism of toxicity."

Historically, the potential health risk associated with exposure had focused on ***single pathways of exposure***, i.e. through food, water or residential use for ***individual chemicals***, not on the potential for individuals to be exposed to ***multiple pesticides*** by ***all pathways concurrently.***

On June 18, 2002, the EPA held a technical briefing on the Revised Cumulative Risk Assessment for the organophosphate pesticides (OP) in Alexandria, VA. Preliminary results from the assessment, which reviews more than 1,000 pesticide food tolerances, indicate that the regulatory actions already taken by the EPA during the past six years have substantially reduced the risk posed by these pesticides and will meet the tough standards set forth in the FQPA.

Highlights of the Revised CRA include:

- There will be no wholesale cancellation of OPs as a result of this assessment;
- OPs in drinking water are not a major source of cumulative exposure;
- Residential use is not of great concern given the cancellation of chlorpyrifos and diazinon for these purposes;
- A few questions concerning dietary exposure remain that **may** require further mitigation but these are specific product/commodity combinations that should not greatly affect tree fruits.

Cumulative risk assessment has not been finalized. The public comment period just ended in September and several OP individual risk assessments have not been completed and therefore have not been incorporated into the cumulative assessment. The CRA document should be finalized by the end of this year.

Finalization of Azinphosmethyl IRED

On August 2, 2002, EPA announced the finalization of the Interim Registration Eligibility Decision (IRED) for azinphosmethyl (AZM). This document outlines the regulatory actions the Agency will take to restrict the future use of AZM based on their review of the compound as mandated by the FQPA. The basic provisions of the IRED were first made public in October 2001 and although there were some minor revisions in the final document, the tree fruit crops were minimally affected.

Highlights of the azinphosmethyl IRED include:

- Time-limited registration (cancelled 12/05 unless submitted data indicate registration should be continued):

  almonds, **apples**, blueberries, Brussels sprouts, **cherries**, nursery stock, parsley, **pears**, pistachios, and walnuts;

- Phased-out (cancelled 8/05 and cannot be used after 12/05):

  cotton, cranberries, **nectarines**, **peaches**, potatoes, southern pine seed orchards, and caneberries;

- Cancelled (no more sales after 9/1/02 but existing stocks can be used):

  alfalfa, beans, birdsfoot trefoil, broccoli, cabbage, cauliflower, citrus, celery, clover, cucumbers, eggplant, filberts, grapes, melons, onions, pecans, peppers, **plums**, quince, spinach, strawberries, and tomatoes.

The exact conditions under which AZM use on apples will be allowed during the next four years are currently unknown as EPA has yet to finalize the label. However, it is **very likely** the label will include the following:

1. A reduction in the total amount of product allowed per acre / per season;
2. A 14-day restricted-entry interval for most activities except possibly fire blight shoot removal;
3. An extended pre-harvest interval for PYO operations;
4. More restrictive language regarding spray drift management (see reducing spray drift handout).

It is our understanding that the registrants of azinphosmethyl are fully committed to the product and will continue to work with EPA with respect to the crops that have either a time-limited registration or are scheduled to be phased-out. The registrants are currently conducting numerous studies requested by EPA to generate data in support of the continued use of AZM beyond 2005.

Candidates for Reregistration

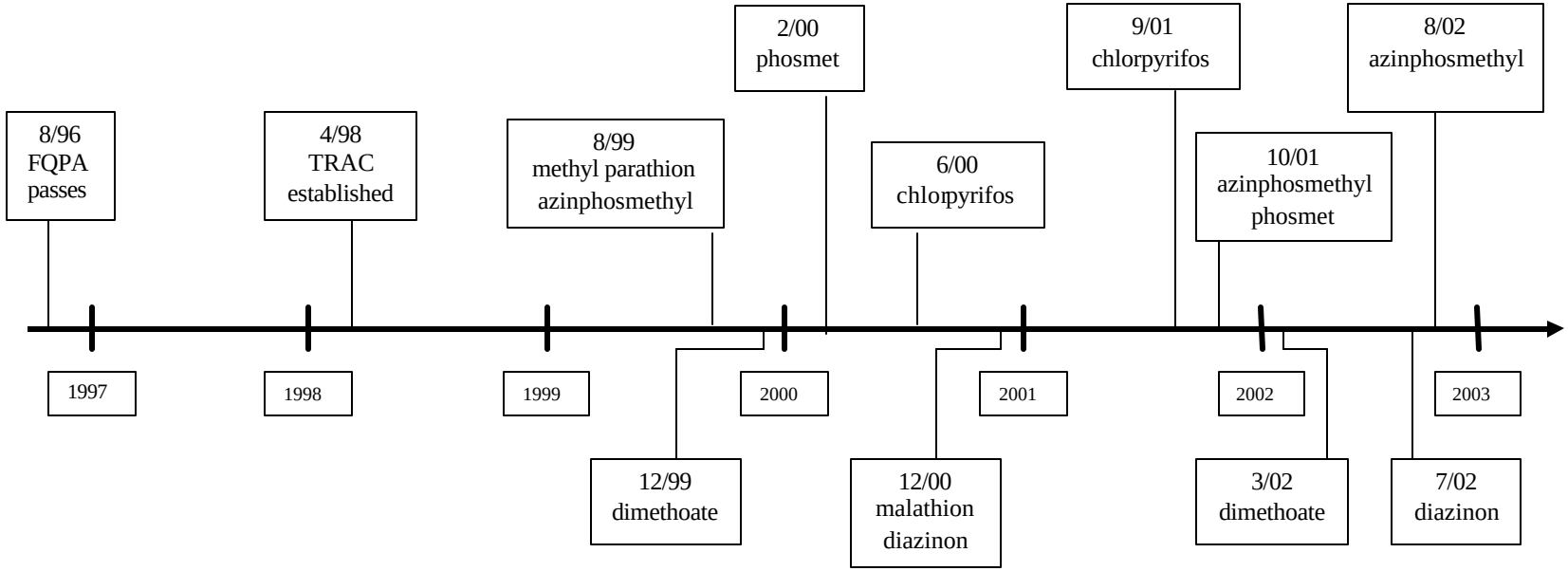
EPA plans to make risk management decisions for many of the candidate pesticides listed below during the fiscal years 2002 and 2003. Any uncompleted FY 2002 candidate pesticides will have become 2003 candidates as of October 1, 2002, when the new fiscal year began. These decisions will be made through either the reregistration or tolerance assessment programs and will take the form of either REDs, IREDs or TREDs.

FY 2002	FY 2003
endosulfan (7/02)	fenvalerate
thiophanate-methyl	formetanate HCL
ziram	permethrin
dimethoate	thiram
fenbutatin oxide (5/02)	malathion
fenarimol	carbaryl
	esfenvalerate

The slide presentation for this talk can be viewed at:

http://www.massfruitgrowers.org/nefrtmtg/proc--2002-03/a04pp/

Food Quality Protection Act/ Organophosphate Timeline of Events 1996 – 2002



Food Quality Protection Act/ Organophosphate Timeline of Events 1996 – 2002

8/1996 – **Food Quality Protection Act** (FQPA) passes. EPA must systematically reassess tolerances for all active ingredients registered at the time in accordance with more stringent safety standards including special protection for children.

4/1998 – **Tolerance Reassessment Advisory Committee** (TRAC) established.

8/1999 – **Methyl parathion:** Revised risk assessment released. Primary concern was acute dietary risk to children. EPA accepted registrant's voluntary cancellation for apples, peaches, pears, nectarines, cherries, plums, and others effective 12/99.

8/1999 – **Azinphosmethyl:** Revised risk assessment released. EPA concluded unacceptable dietary risk to children, unacceptable ecological risk (deleted uses on cotton, sugarcane, ornamentals, Christmas trees, shade trees, and forest trees) and of concern for risk to agricultural workers.

12/1999 – **Dimethoate:** Revised risk assessment released. Dietary issues **not** a concern. EPA cited problems with ecological risks and worker exposure.

2/2000 – **Phosmet:** Revised risk assessment released. Acute dietary risk **not** an issue. Pprimary concern was for post-application workers who may contact residues.

6/2000 – **Chlorpyrifos:** Revised risk assessment released. EPA identified both dietary and non-dietary risks especially to children. Registrant signs MOA to voluntarily cancel post-bloom uses on apples (except DWB trunk sprays) as well as most residential uses and most outdoor non-residential uses effective 12/00.

12/2000 – **Diazinon:** Revised risk assessment released. Dietary of minor concern. Major issues were drinking water contamination from residential use, ecological risks (bird kills), and worker exposure. EPA accepts voluntary termination of all indoor uses and a 4-year phase-out of lawn and garden uses (combined total approx. 75% of total use) and cancellation of agricultural crop uses yet to be determined.

12/2000 – **Malathion:** Revised risk assessment released. Dietary **not** a concern. Some residential problems as well as post-application exposure to workers and ecological concerns (fish and aquatic invertebrates).

9/2001 – **Chlorpyrifos:** IRED released. Dietary exposure below level of concern. Risk mitigation centered around agricultural workers, i.e. increased PPE, engineering controls, etc.

10/2001 – **Azinphosmethyl:** IRED released. EPA proposes 3-tier regulatory process including cancellation of 28 crop uses, phase-out of 7 crop uses, and 4-year, time-limited registration for 8 crop uses. Restrictions concerning REI, PHI, and total

amount of product allowed, amongst others, are proposed. Registrant did not agree and negotiation/litigation resulted.

10/2001 – **Phosmet:** IRED released. EPA proposed 5-year, time-limited registrations for apples, apricots, nectarines, peaches, pears, and plums. Proposed REI increase from 1 to 3 days for all of above crops. PHI remained the same for all. Continued registration for 33 other crops. Registrant agrees to terms and signs off. New label to became effective 6/30/02.

3/2002 – **Dimethoate:** EPA published cancellation order for all indoor uses, certain agricultural uses (housefly treatments on farm structures, farm animals and manure piles), and certain outdoor non-agricultural uses.

7/2002 – **Diazinon:** IRED released. Tolerances remain the same for apples, apricots, cherries, nectarines, peaches, pears, and plums. Limited to one application per season (wooly aphid only on apples). REI increases from 1 to 4 days. Cancellation of all granular registrations, and cancellation of foliar uses on all vegetable crops.

8/2002 – **Azinphosmethyl:** IRED finalized. Similar to proposed IRED released 10/2001.

PREPLANT SITE PREPARATIONS: WHAT WORKS AND WHAT DOESN'T IN NORTHEAST ORCHARDS?

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Summary

As New York growers renovate old orchards, apple replant disease (ARD) has become a major problem. Past research at Cornell has shown that ARD problems occur at more than half the farms statewide. Chemical soil fumigation sometimes controls ARD, but fumigation responses have been variable and may be linked with environmental problems. Other possible control tactics for ARD include preplant cover crops of marigolds, Brassicas (mustards) and certain Sudan grass varieties, correction of soil compaction, nutrient and pH problems, and disease resistant rootstocks. Six years ago, we began a project to test and develop comprehensive strategies for diagnosing and controlling orchard replant problems. With funding support from NY apple growers, we have been testing methods for predicting the severity of ARD, and biological or chemical strategies for controlling ARD, at selected commercial apple orchards in the state's major fruit-growing regions. Soils from 17 orchards were sampled during 1996 to 1998 for nematode populations and nutrient status, and growth of apple seedlings or grafted rootstocks was compared in fumigated, pasteurized, and untreated field soil. At the same time, six or seven preplant soil treatments were evaluated at each orchard: 1) No treatment (Control); 2) Brassica/Sudan grass cover crops (B/S); 3) Lime and fertilizer amendments (L/F); 4) Lime and fertilizer plus Brassica/Sudan grass (LFB/S); 5) Lime and fertilizer plus Vapam fumigation (LFV); 6) Vapam soil drench; and 7) Telone C-17 soil fumigation. The following year, apple trees were planted into each preplant treatment, and since then we have measured tree growth, fruit yields, and nutrient uptake each year. The preplant bioassays indicated ARD problems at two-thirds of these orchards—seedlings or grafted trees grew much better in pasteurized or fumigated soil. Nematode populations were below damage thresholds at most sites. In subsequent years, tree responses to the preplant treatments have been inconsistent from farm to farm. Fruit yields varied up to five-fold among the orchards. At a few sites, trees responded positively to fumigation, while at others the best growth and yields occurred in fertilizer/cover crop treatments, or there was no significant response to any preplant treatment. The initial diagnostic bioassays over-predicted substantially the subsequent tree growth responses to soil fumigation in most orchards. As we finish tree growth and fruit yield measurements at these sites, the results indicate that preplant soil fumigation, fertilizer amendments, and pest-suppressive cover crops will not guarantee good growth and early yields of apple trees unless growers can also manage successfully all the other factors that sometimes limit replant establishment and success.

Introduction

When fruit growers renovate and replant apple orchards, the new trees often grow poorly and fail to meet expectations for early yields or profitability. This problem is sometimes called apple replant disease (ARD) and has been the subject of extensive research in New York, Washington and Europe (Mai et al, 1994). Abiotic problems such as soil nutrient depletion, compaction or acidification, and phytotoxic residues of arsenic or old roots have been associated with ARD. Biotic problems such as parasitic nematodes or fungal and bacterial pathogens of tree roots have also been implicated. European fruit growers consider ARD a major threat, and have relied upon a greenhouse bioassay comparing seedling growth in untreated vs. steam-pasteurized or fumigated soil, to diagnose ARD problems. In this bioassay a 50% increase in seedling growth in treated soils is considered the action threshold for recommending soil fumigation before replanting (Gilles and Bal, 1988; Scotto La Massese et al, 1988). In the past decade we have tested soils from 50 orchards in the Lake Ontario, Lake Champlain, Hudson Valley, and Long Island regions with this diagnostic bioassay, and about two-thirds appeared to have serious ARD problems (Merwin, 1995).

Broad-spectrum preplant soil fumigants such as methyl bromide, 1,3-dichloropropene plus chloropicrin (Telone™ C-17), or metam sodium (Vapam™) provide temporary suppression of soilborne pathogens and weeds, and have dramatically increased growth and yields of replant trees in many regions (Mai et al, 1994; Smith, 1993, 1994). With fewer options and increasing costs for chemical controls, there is renewed interest in using preplant cover crops as biocontrols to suppress nematodes and/or other ARD pathogens. In previous studies of NY orchards, cover crops of marigolds (*Tagetes patula*), Sudan grass (*Sorghum sudanense*), and 'Saia' oats (*Avena sativa*) reduced ARD, but results varied greatly from one site to another (Merwin, 1995). In Europe, growers have used oilseed mustards (*Brassica nigra* and *B. juncea*) as cover crops to suppress soilborne pathogens and improve tree growth. Recent research by Dr. Rosemary Loria and others in the Dept. of Plant Pathology at Cornell University identified two mustard cultivars—'Forge' and 'Cutlass'—with high concentrations of allylisothiocyanates that could suppress fungi or nematodes when grown as a cover crop and incorporated into the soil.

Past research by Dr. Warren Stiles suggested that depletion of essential soil mineral nutrients, and soil acidification from long-term sulfur or nitrogen applications, could also limit the growth of replanted apple trees. There is not much information available on the interactions between previous groundcovers or cropping history, soilborne plant pathogens, and nutritional deficiencies in NY orchards. We therefore included fertilizer treatments with the other factors tested in this project.

The economic impacts of ARD have not been studied much in NY, but we do know that when poor tree establishment delays and reduces yields in high-density plantings, substantial economic losses can result. Economic studies demonstrate that orchards with serious ARD problems are likely to be unprofitable (Geldart, 1994; White and DeMarree, 1992). Considering all these factors, replant problems definitely pose a serious threat to sustainable and profitable apple production. Developing and validating a comprehensive system of ARD diagnosis and control is therefore a priority for the NY fruit industry. Hence, our main objectives in this project were to:

1) Assess the extent and severity of ARD in NY State with bioassays using apple seedlings and grafted rootstocks to test the potential benefits of soil pasteurization and/or fumigation.
2) Evaluate growth and yield of apple trees planted following Vapam or Telone C-17 soil fumigation,

Mustard/Sudan grass cover crops, and soil pH and fertility amendments.

3) Compare the field performance of apple trees in fumigated orchard plots with the results of preplant diagnostic bioassays, to determine the reliability of these bioassays for NY orchards.
4) Develop extension recommendations for preplant soil treatments and adjustment of orchard tree spacing, based on validated soil bioassays and on-farm economic responses to ARD controls.
5) Conduct extension programs including orchard field tours, winter meetings and workshops. Upon completion of the research, write a comprehensive bulletin explaining the causes and extent of replant problems, and appropriate diagnostic and control strategies for NY state.

Research Methods

Each year, five to seven orchards were selected within the state's major fruit growing regions. Soil was sampled extensively at each orchard and analyzed for parasitic nematodes, essential plant nutrients, and physical/chemical properties. Experimental objectives and designs were discussed with participating growers and regional extension specialists. The following preplant treatments were selected: 1) No preplant soil treatments (Control); 2) Soil amendments with lime and fertilizers according to Cornell recommendations as determined for each site by Dr. Warren Stiles (LF);
3) Soil-drench with Vapam at 100 gallons per treated acre, or shank injection of Telone C-17 at 35 gallons per treated acre; 4) Preplant cover crops of Brassica (*B. juncea* cv. Forge) seeded in June, then tilled under and reseeded with Sudan grass (cv. Trudan-8) in late July, which was then tilled down in September (B/S); 5) Lime/fertilizer amendments plus treatment with Vapam (LFV); 6) Lime and fertilizers plus the Brassica/Sudan grass cover crops (LFB/S).

After obtaining 500 kg of composite soil samples throughout each test orchard, plots were blocked out and the first treatments applied in May when the Brassica cover crop was planted. In mid-July, the Brassica was chopped, tilled down, and Sudan grass was seeded. In September, the Sudan grass was chopped and incorporated, the macro/micronutrient fertilizers and lime were applied and worked into the soil, and the Vapam and Telone C-17 were applied. After preplant treatments were completed, the sites were fallowed during winter, and four to six trees were planted into each treatment replicate by growers in April of the following year.

Concurrently with establishing the preplant treatments at each orchard, we also conducted a series of apple seedling and grafted rootstock ARD diagnostic bioassays at a greenhouse and outdoor nursery in Ithaca, NY, using the soil sampled from each site. Nematode identification and counts were performed in the initial soil samples, and again on a second set of samples taken from the Brassica/Sudan grass and untreated control plots in early October. Dormant bare-root 'Gala' or 'Jonagold' trees were obtained from commercial nurseries on M.9 and M.26 rootstocks, using the varieties and rootstocks that each participating grower intended to plant. Grafted trees were grown in ten 20-liter pots of soil from each farm, in an outdoor nursery. There were five pots of pasteurized or Vapam treated soil, and five pots of untreated field soil from each orchard. At planting, trees were headed to 1-m height, lateral branches were removed, and drip irrigation was provided with granular N-P-K fertilizer applications every two weeks. In late October, we measured and weighed all new lateral and central leader growth of each potted tree.

When trees were planted at each test orchard the year after preplant treatments (i.e. in April or May, 1997—1999), we measured tree caliper 40 cm above the graft union. As trees subsequently grew and came into production, we measured trunk caliper, and counted and weighed fruit samples from the center two trees in every plot annually at each orchard—with timely assistance from the

growers and local Cooperative Extension specialists.

Results & Discussion

Preplant diagnostic bioassays. For most of the tested soils, there was a substantial increase in grafted tree growth after soil pasteurization or fumigation (Figure1; Photo. 1). However, a few soils each year showed negligible tree-growth responses, or even negative responses, to bioassay soil treatments (for example, orchard ON-5 in Fig. 1). In the seedling greenhouse bioassay tests for these same soils, somewhat different results were obtained (Fig. 2). In some bioassays we included both steam pasteurization and Vapam treatments, and observed that soil pasteurization was often more effective than Vapam treatment for improving seedling growth, but the structure of several soils (usually sandy loams) was damaged by steam pasteurization. In gravelly loam soils of Washington, Vapam has been effective in controlling ARD (Smith, 1993); it may be less effective in NY soil types, or higher than labeled rates may be required for Vapam to control ARD in our soils.

Averaged for all 17 soils tested in three years of bioassays, the growth responses of seedlings and grafted trees to pasteurization or fumigation treatments were remarkably similar. Apple seedling biomass ratios in pasteurized vs. untreated field soil in greenhouse tests averaged 1.48 (range of 0.6 to 3.2); the ratios for seedlings in Vapam vs. untreated soil averaged 1.43 (range of 0.7 to 3.3); and the ratios for grafted trees grown outdoors in 5-gallon pots of pasteurized vs. untreated soil averaged 1.46 (range of 0.5 to 3.5). In other words, despite the different soil types and site histories, growth of apple seedlings and grafted trees in preplant bioassays was increased an average of 43 to 48% by steam pasteurization or Vapam treatments.

Preplant soil treatments at test orchards. Soil types at the 17 farms included sandy loams, gravelly loams, silt loams, and clay loams. Weather conditions during preplant treatments and the first 2 to 4 years of replant tree establishment were also variable—including droughts, floods and hailstorms. Across this range of growing conditions, the cover crops of Brassica and Sudan grass established reasonably well (Photo. 2), providing sufficient biomass for soil improvement and pathogen suppression at most sites. Persistent residues of simazine and other herbicides prevented good cover crop establishment at a few orchards. Also, it was difficult to incorporate cover crop residues thoroughly into the root-zone at farms where large rocks and/or drought-hardened soils prevented rototillers from penetrating deeply into the topsoil. Nematode populations were low at the outset in most orchards, and were not suppressed further by either cover crop treatment. In fact, lesion nematode (*Pratylenchus* spp.) populations actually increased on the Brassica cover crop.

Replant tree growth in test orchards. In contrast with the generally positive growth responses to soil fumigation or pasteurization in our preplant bioassays (Figs.1-2), tree growth after replanting each orchard was highly variable and did not respond consistently to soil treatments (Figs. 3A-C). There were few significant differences among treatments at each site, but the differences in growth among the 17 orchrds were impressive. Trees in the Champlain Valley grew less on average in all treatments, compared with other regions of the state with longer growing seasons (regional site designations in the accompanying figures are: CV=Champlain Valley, HV=Hudson Valley, ON=Ontario shore region, and LI=Long Island). The best overall growth and the most positive response to preplant fumigation and fertilizers were observed in one Long Island orchard. At four sites (HV-1, HV-2, CV-2 and LI-1) tree growth was increased by Vapam treatments with or without fertilizers. A combination of Brassica/Sudan grass cover crops and fertilizers promoted better tree growth at two Ontario region orchards (ON-1 and ON-6). Where Vapam and Telone C-17 could be compared directly (Fig. 3-C

for the 1998 sites), neither was very effective in comparison with untreated control plots. In general, the responses to preplant soil treatments were not significant and would not have justified the expenses of fumigation or fertilizer applications at most of the test orchards.

Yield responses to preplant treatments. At five orchards (LI-1, HV-2, HV-3 and ON-2 and ON-5), trees cropped in the second or third leaf, with relatively good production in all treatments and a positive response to the Vapam, LFV or LFB/S relative to Control treatments (Figs. 4A-C). At orchard CV-3, on a sandy loam soal, the yield response to Telone-C17 was greater than to Vapam (Fig. 4-C). At the best yielding of the 1998 sites (HV-5) there was no significant response to any preplant treatment. In five of the best yielding orchards (LI-1, HV-1, HV-2, HV-5 and ON-2), the growers obtained well feathered, large caliper trees and were able to irrigate when necessary. Comparing preplant treatment responses over different soil types and years (Figs. 5A-B), the trends were also mixed, suggesting that preplant cover crop, fertilizer or fumigation responses were not consistently affected by soil texture, organic matter or water holding capacity.

There were many factors beyond the scope of our experimental treatments that probably limited growth and yield of replanted trees at test sites, and might have negated the potential benefits from preplant treatments. For example, weed control in the new plantings was often inadequate. Potato leafhopper infestations caused trees at several orchards to stop growth in mid-summer. There were severe drought periods in some non-irrigated plantings, and one orchard was flooded repeatedly during the first year. Many of the trees at one site had suffered winter injury at the nursery and had to be replaced after their first growing season. Trees obtained for planting at some orchards were low-grade and unfeathered. Meadow voles and fireblight severely damaged or killed trees at two orchards. The lower trunks of trees at one site were completely girdled by plastic baling twine used to tie-down branches. Any one of these problems would be serious enough to counteract the potential gains from preplant soil treatments for ARD.

The preplant diagnostic bioassays appeared not to predict reliably the subsequent replant tree responses to soil fumigation at most of these 17 orchards. However, it is also possible that the 45% average increase in bioassay tree or seedling growth observed following soil fumigation or pasteurization under optimal nursery and greenhouse conditions in the diagnostic bioassays was a valid indication of the potential benefits of controlling soil-borne pathogens when all other growing conditions were optimal for newly planted apple trees. Similarly, the excellent tree growth and impressive yields in the second or third leaf at 5 of the 17 test sites represents a realistic goal that should also be attainable for other New York apple growers under ideal conditions.

These are difficult times for the world apple industry, and growers everywhere are working hard to cut costs and survive in the fruit business. Under such circumstances, it is easy to understand how replanting orchards and meticulous care for non-bearing orchards may not be top priorities for fruit growers. Our research demonstrates that preplant soil treatments are not “cure-alls” for apple replant problems. Without close attention to all the essential details of orchard replant management, it appears that soil fumigation, fertilizer amendments, and disease-suppressive cover crops will not guarantee successful renovation of old apple orchards.

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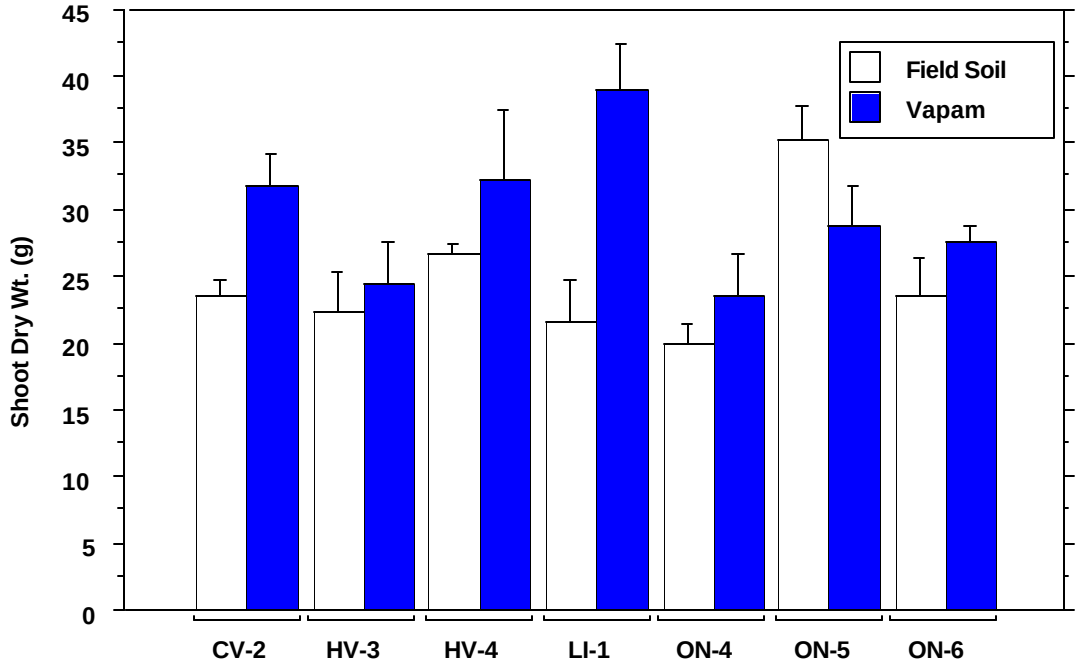


Figure 1. Relative total new shoot biomass for 'Gala' apple on M.9 rootstocks after 6 months growth in 20-liter pots of Vapam treated and untreated Field soil from seven NY orchards tested in 1997. Trends were similar in the 1996 and 1998 diagnostic bioassays. Site designations are: CV=Champlain Valley, HV=Hudson Valley, ON=Ontario lake region, and LI=Long Island region.

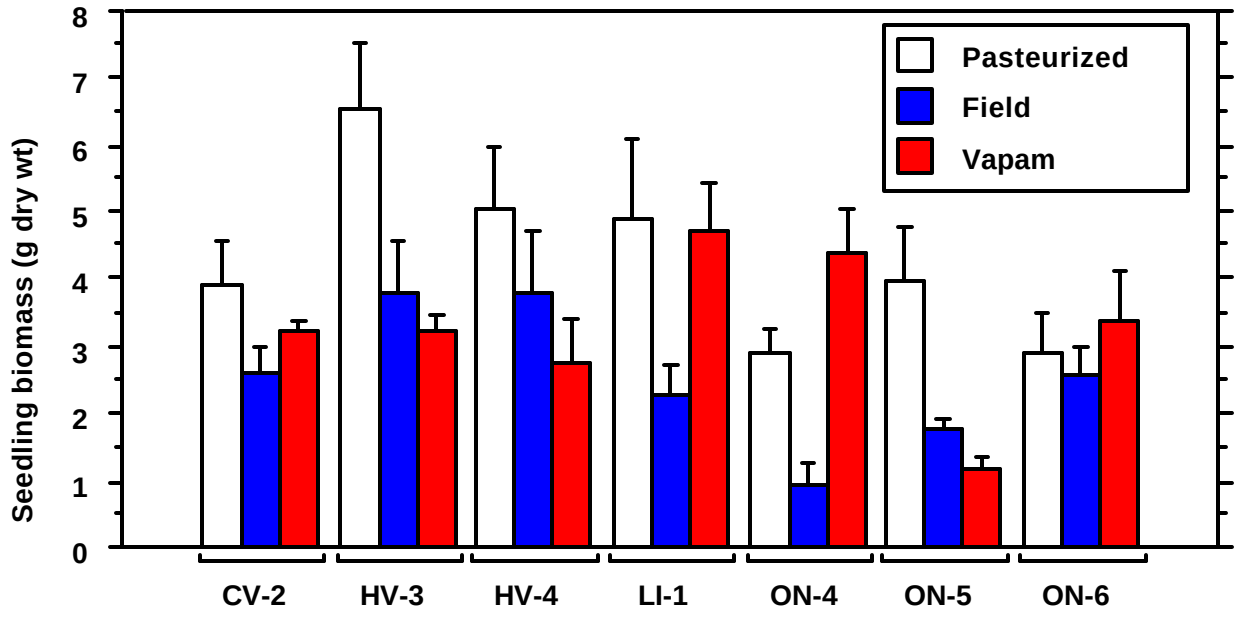
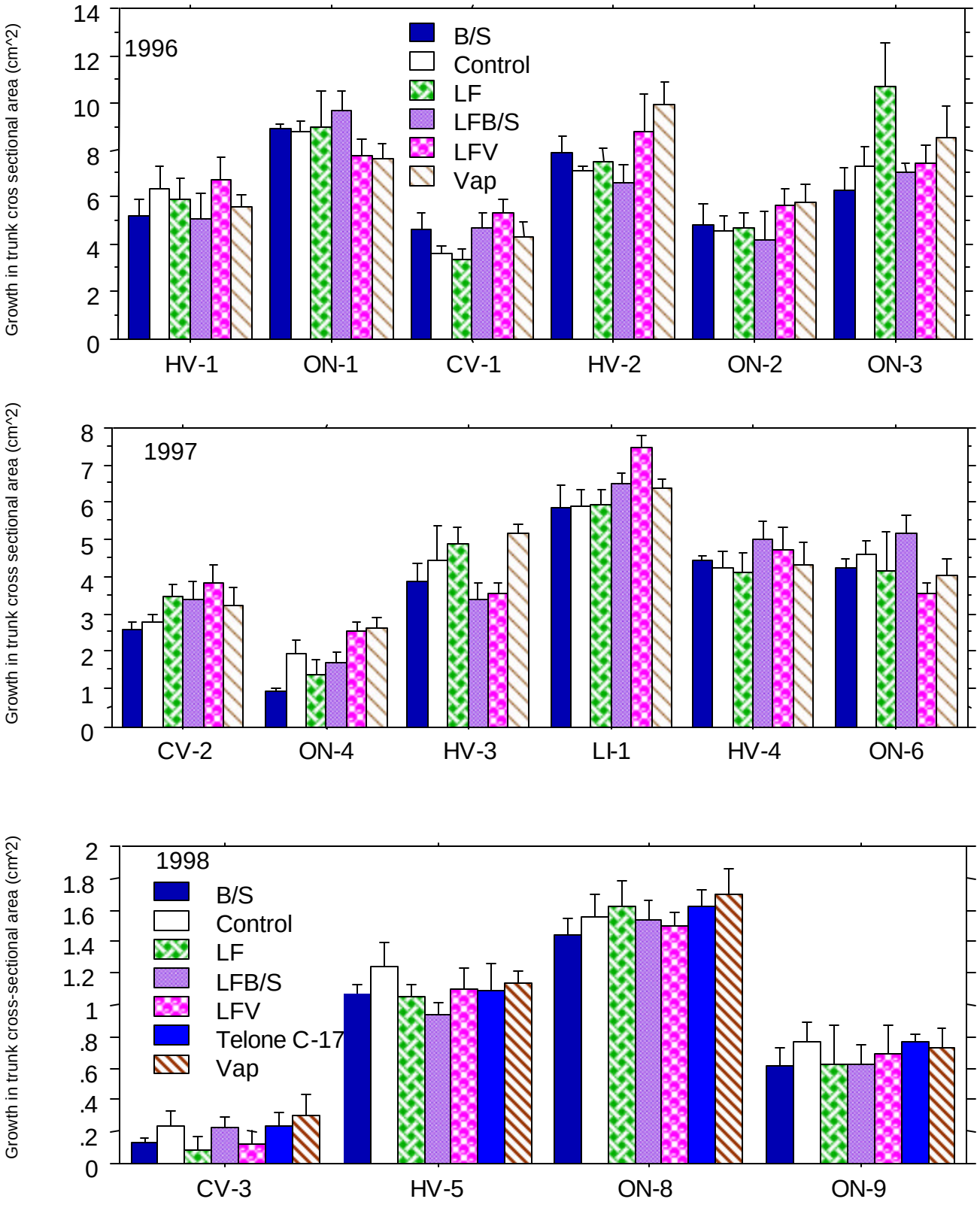
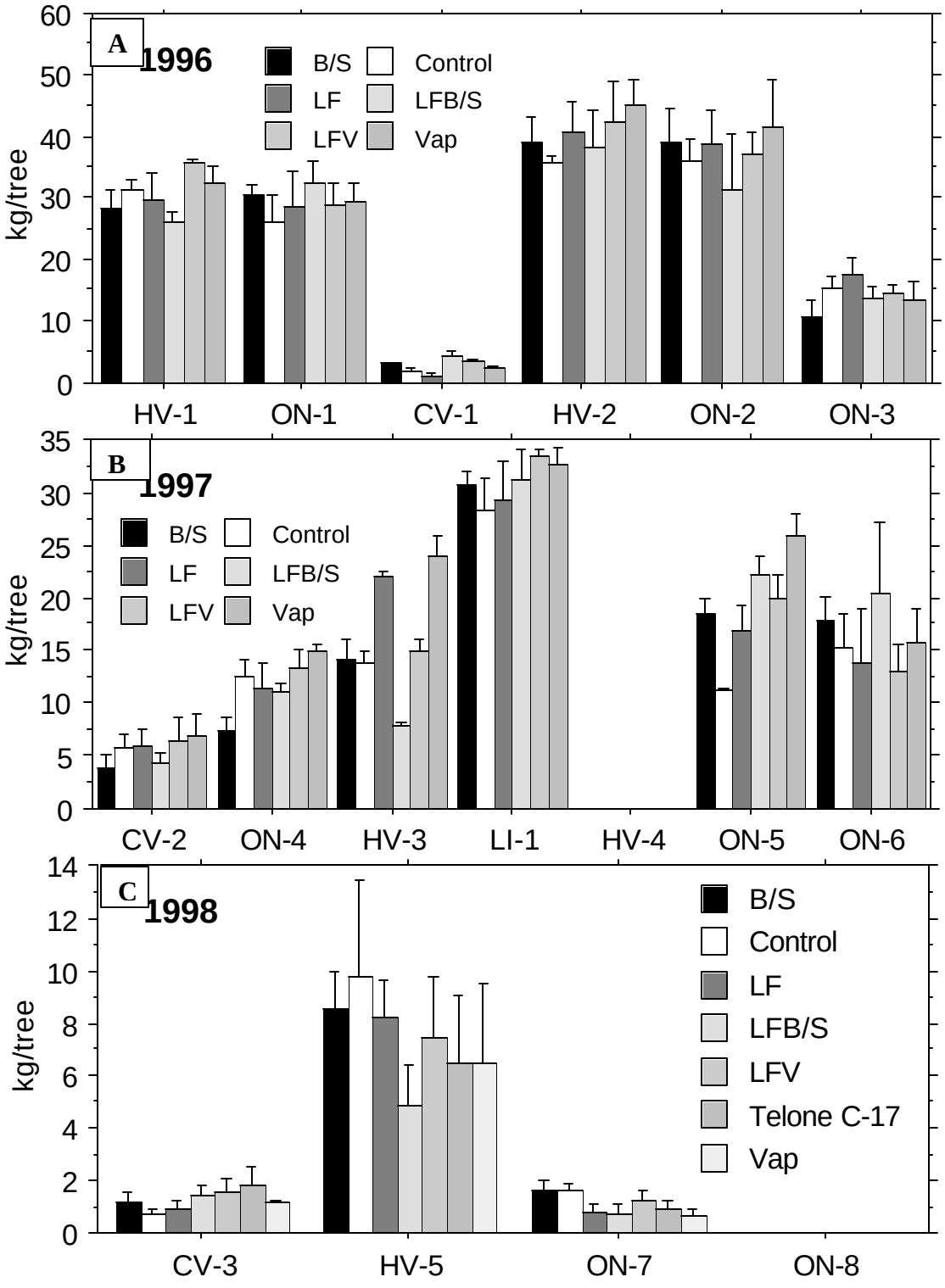


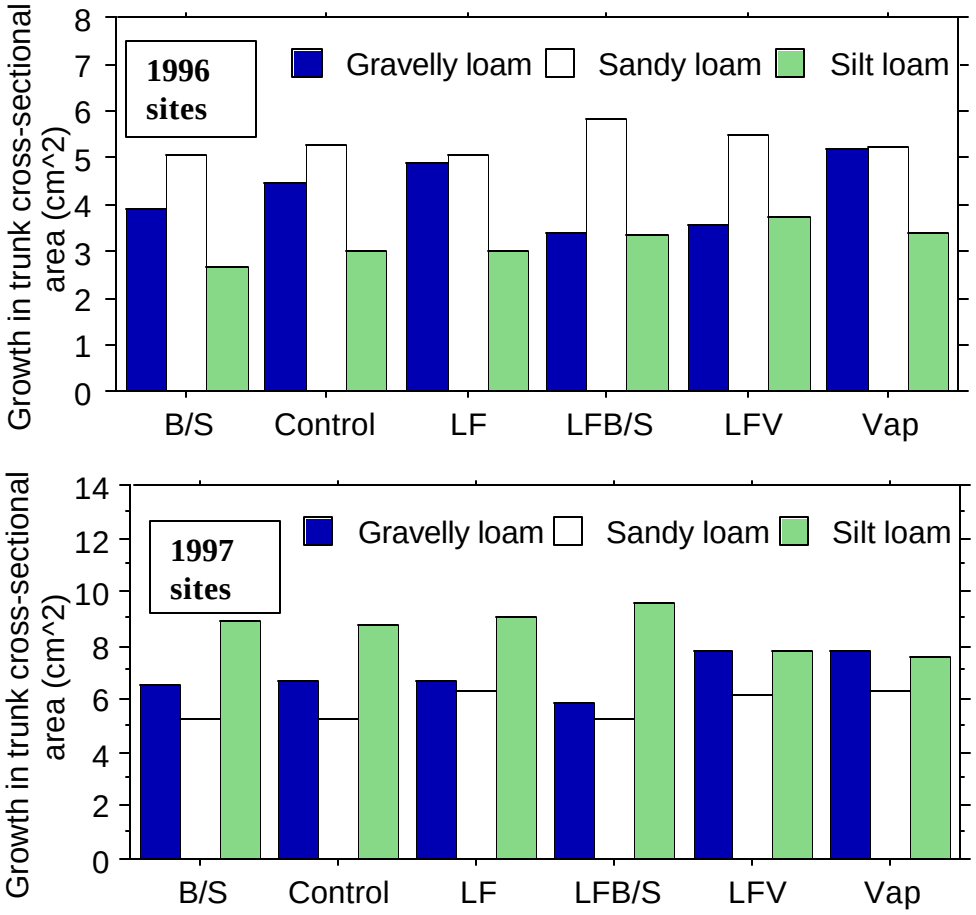
Figure 2. Comparison of 'Northern Spy' seedling apple growth (total grams dry weight) after 80 days in a greenhouse, growing in 2-liter pots of Pasteurized, Vapam treated, and untreated Field soil collected from seven New York orchards in 1997.



Figures 3A-C. Cumulative tree growth in trunk cross-sectional area as of Fall 2000 for 17 NY orchards after different preplant soil treatments in 1996, 1997, 1998.



Figures 4 A-C. Cumulative fruit yields (kg harvested per tree) as of Fall 2001 at 17 New York orchards where different preplant treatments were applied 1996-1998, for control of apple replant disease. Harvest data were not obtained in 2001 for CV-1, ON-8, HV-4, and LI-1.



Figures 5A-B. Apple tree growth (cm ^{2} of trunk cross-sectional area) following different preplant treatments in 1996 and 1997, grouped by orchard soil type.

Photo 1. A typical tree growth response of 'Gala' on M.9, grown outdoors for 6 months in a 20-liter pot of steam-pasteurized soil (tree on left) vs. untreated field soil (tree on right) from one of test orchards.

Photo 2. Treatment stands and randomization of preplant mustard (*Brassica juncea* cv. Forge) cover crop in a test orchard just before mowing and soil mixing cover crop residues in July.

ORCHARD GROUNDCOVER MANAGEMENT: LONG-TERM IMPACTS ON FRUIT TREES, SOIL FERTILITY, AND WATER QUALITY

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Summary

Nitrogen (N) fertilizers can increase tree fruit yields, but if applied in excess they also may contaminate water resources. We are studying the availability, uptake, recycling and losses of N in a New York apple orchard, using a naturally occurring non-radioactive nitrogen isotope (^{15}N) to trace N dynamics year-round under different soil and groundcover management systems (GMSs). Our goal is to identify factors that sustain tree growth and yield, maximizing N uptake and minimizing N losses. We have amassed three years of continuous data at the test orchard, and are just beginning the comprehensive data analysis. Some preliminary conclusions are that hardwood bark mulch and mowed turfgrass reduced N losses and improved soil quality substantially. Early summer was the critical time for N uptake by trees, and N leaching was relatively low (less than 5 ppm nitrate-N) in all GMSs. Post-emergence glyphosate application in May and July annually, that permitted substantial weed regrowth and soil groundcover from August to May each year, was the best GMS from the fruit yield perspective, followed closely by the mulch treatment. Year-round weed-free tree rows maintained by residual herbicides treatment—the industry standard in much of North America—ranked second to last in terms of fruit yield and tree growth after 10 years of observations. Bark mulch increased soil organic matter, supported excellent fruit yields, and did not result in leaching losses of N despite the nitrogen and organic matter additions it provides to soil.

Research Objectives

1. Determine the effects of different groundcover management systems (mowed turfgrass, hardwood bark mulch, and pre- and post-emergence herbicides) on apple tree growth and productivity, and nitrogen release, uptake, retention and recycling in a northeastern apple orchard.

2. Integrate and synchronize groundcover vegetation management in relation to critical periods of fruit-tree N demand and leaching losses, managing the groundcovers to prevent erosion and retain excess N during periods of low crop demand, so as to minimize N losses from orchards.

Methods and Approach

Many orchards are located on well-drained upland sites near rivers and lakes where nitrate and phosphate contamination of surface and groundwater is a potential problem. Nitrogen (N) pollution of water resources can affect ecosystems and human health, but it can be reduced by increasing the efficiency of nutrient, crop and soil management. We are studying the impacts of alternative groundcover management systems (GMSs) on the nutrient status of apple trees, and the mineralization, uptake, retention and losses of N in an orchard agroecosystem. Four GMSs have been maintained

continuously since 1992 in the tree-rows of a commercial orchard near Cayuga Lake in upstate New York: 1) A mowed red fescue turfgrass (MwSod); 2) a hardwood bark-chip mulch (ChpMulch); 3) a conventional pre-emergence residual herbicides treatment (PreHrb) that keeps soil weed-free all year; and 4) May and July post-emergence herbicide treatments (PostHrb) that permit weed re-growth and sparse soil cover from August to May.

We are using ^{15}N enriched stable isotopic fertilizer to trace the movement of N throughout the test orchard. A small amount (0.5 g of 99% enriched $K^{15}NO_3$) of fertilizer was applied on May 10, 1999 beneath the drip-lines of 24 trees (2 trees per GMS replicate plot). In subsequent years, we used different trees for all treatments, and added a split application treatment, applying 0.5 g of 99% enriched $K^{15}NO_3$ to 24 trees (two trees per GMS plot) on May 3, 2000, and 0.17 g in three split application to another 24 trees in mid May, July and September. We are collecting biweekly samples of root-zone soil, drainage and suction lysimeter ground water, shoots, leaves and fruit from trees, and groundcover vegetation from each plot during each growing season, and analyzing their total N content, atom-percent ^{15}N proportion, and total carbon by mass spectroscopy. The ^{15}N tracer enables us to determine the uptake efficiency and biological pathways of N under each GMS, and since the quantity of N is relatively small compared to typical N fertilizer programs in orchards, our observations reflect the intrinsic efficiency and dynamics of N cycling and uptake in fruit trees adapted to low N supply. All other orchard studies involving N isotope tracers have applied large quantities of N to trees that had regularly received such fertilizer applications. Our data will thus provide some very different information about orchard N dynamics under low-input conditions typical of many orchards on high fertility soils in the cool humid climate of the Northeast. Collectively, these data represent the most comprehensive information to date on the year-round dynamics of N in a representative commercial orchard under different soil management systems.

Results to Date

We collected more than 10,000 tree, soil, water and fruit samples during the three years of this study, and have almost completed sample processing and analysis at the time of this report. Fruit yields per tree have been affected significantly by the GMSs, ranking PostHrb = ChpMulch > PreHrb > MwSod, and ranging from 55 to 110 kg per tree from 1999-2001 (Figure 1). Nitrogen has been a significant factor in these effects, with substantial differences in soil, leaf, shoot and groundwater N each year. Soil N and carbon content were greatest in the mulch treatment, averaging twofold greater than in the other GMSs (Figure 2). Leaf N content and fertilizer ^{15}N uptake efficiency of trees have been consistently lowest in Mowed Sod plots, and usually higher in the two herbicide treatments. Tree uptake of soil N was very rapid during the early summer (May and June), and then declined steadily during the rest of the growing season. Unlike previous studies of N-saturated trees, the uptake of soil-applied N was almost instantaneous, and it accumulated within days in flowering spurs and leaflets of these low-N adapted trees. Leaf N was remobilized into shoot tissues during Oct. and Nov. each year, then moved rapidly into other storage tissues after leaf drop (late November and early December), and then increased greatly in the shoots during early March the following year. Similar trends have been observed for fruit N content.

The N content and atom-percent ^{15}N (representing the uptake efficiency of applied N) in grass and herbaceous weed groundcover vegetation has differed strikingly from that in our fruit trees. The N content of grass and weeds averaged two to three times greater than in fruit tree tissues, and the efficiency of fertilizer ^{15}N uptake has been similarly greater in groundcovers than in trees. These

observations demonstrate the weak competitive ability of fruit trees relative to groundcovers for soil N supply, and the potential for taking advantage of retention and recycling of N by orchard groundcovers, to reduce off-site N losses. The challenge is to minimize groundcover competition for N during the vitally important early summer months, and then utilize their high affinity for N to keep N in the orchard during the rest of the year.

Losses of N in surface runoff and subsurface leachate from the drainage sampling system have been greater in the PostHrb and PreHrb than in the other GMSs, but relatively low in all the treatments (Figures 3 and 4). Averaged by season, concentrations of nitrate-N in drainage from this orchard typically ranged from undetectable (< 0.1 ppm) to 5 ppm throughout the year. Surprisingly, nitrate-N losses during the irrigation season (May to October) were actually somewhat greater than during the dormant season. Recent growing seasons have been variable—unusually hot and dry during 1999, wet and cool during 2000, and intermittently dry during 2001. Our data therefore cover the range of expected growing conditions in central New York, and suggest that nitrate leaching from orchards with sod drive-lanes receiving low inputs of N fertilizers may be minimal, considerably less than reported for other crops such as corn or potatoes, and comparable to undisturbed forest reservoir watersheds.

The soil at our site is a silty-clay loam averaging 4.5% organic matter content, and mineralizes about 80 kg N per year without any fertilizer additions. This amount of soil N is probably sufficient to meet the needs of mature bearing trees. The ^{15}N fertilizer applied to trees growing in turfgrass plots was almost entirely captured by grass instead of trees during early and mid-summer, while in the bare soil of residual pre-emergence herbicide plots, much of the ^{15}N tracer appeared in leaves of the fruit trees. Leaf N content of trees in all GMSs was adequate, so we considered the elevated tree N uptake in herbicide plots as superfluous and not essential for optimal fruit quality and yields. However, the best cumulative fruit yields were in the post-emergence herbicide and mulch treatments, and the lowest were in grass plots.

Soil temperature and moisture fluctuated substantially among the GMSs during 1999, which was an abnormally hot and dry year in upstate N.Y. Generally, root-zone temperatures were 2 to 4 degrees C warmer under the two herbicide systems compared with grass and mulch plots, and then cooled more rapidly beneath the herbicide treatments in late Fall. During drought conditions, we irrigated the orchard regularly with micro-sprinklers covering the entire treated tree-row area. Despite this irrigation, there were marked differences in soil water content among GMSs. Soil under the grass was usually drier, and under the mulch it was often wetter during early and mid summer, while soil in herbicide plots was usually more saturated later in the growing season and early this winter. These observations may have important implications for nutrient availability and drainage or runoff losses from the orchard.

The final phase of this project will involve integration of practices such as N fertilizer form or timing, and deferring or modifying weed suppression and other GMS treatments during critical periods when fruit tree uptake is not sufficient to retain N within this orchard. We will also develop nutrient budgets for each GMS system, quantifying the amounts and movements of N in each major component of the tree/crop/groundcover/soil/water system. This will enable growers in comparable orchards to adjust their fertilizer programs so that only the amount actually lost from the orchard each year is added in fertilizer form—a strategy that should reduce or eliminate leaching of N from the agro-ecosystem. Results of this study will be made available to growers, students, extension staff and crop consultants, and disseminated in commercial fruit production recommendations and extension bulletins. We hope this project will help sustain fruit growing and conserve our vital soil and water resources in the Northeast.

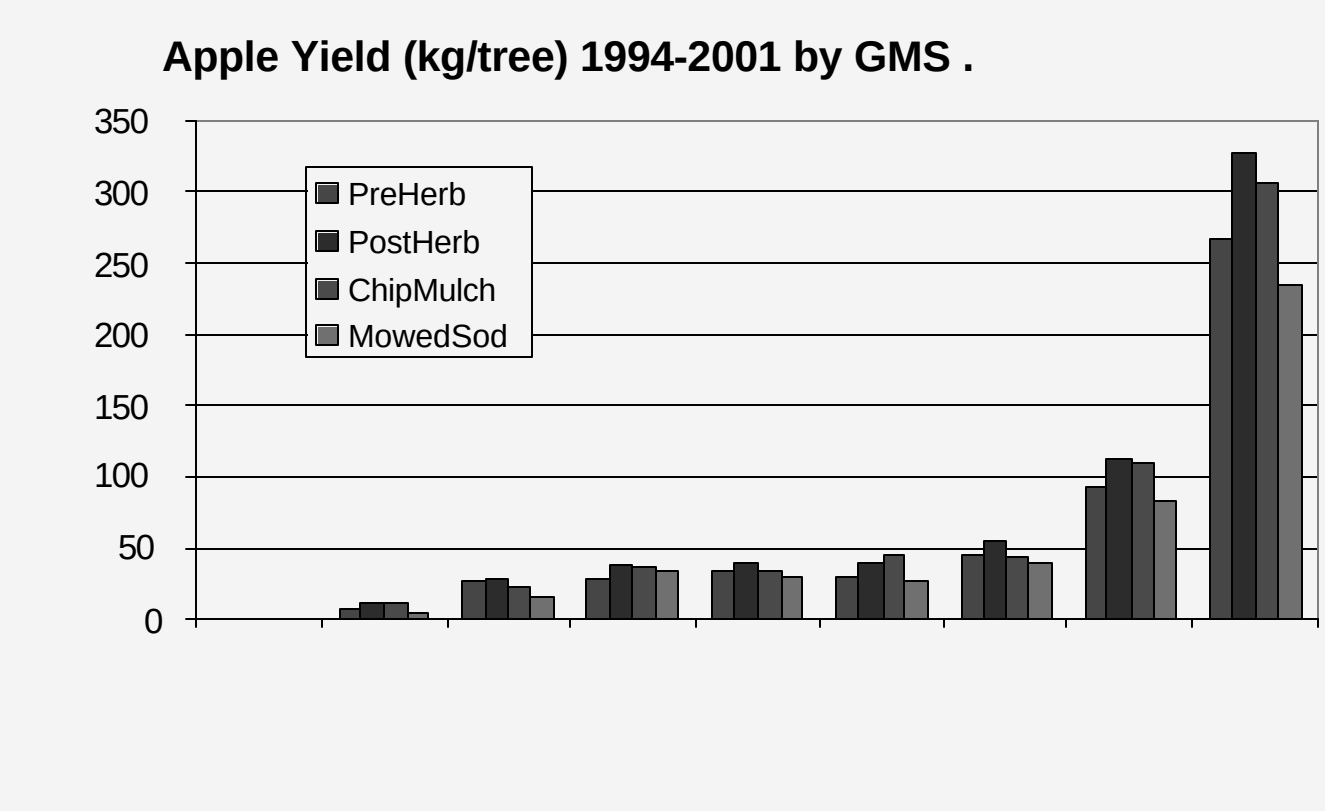

Figure 1. Yearly and cumulative fruit yields in a New York apple orchard during eight years under four different groundcover management systems.

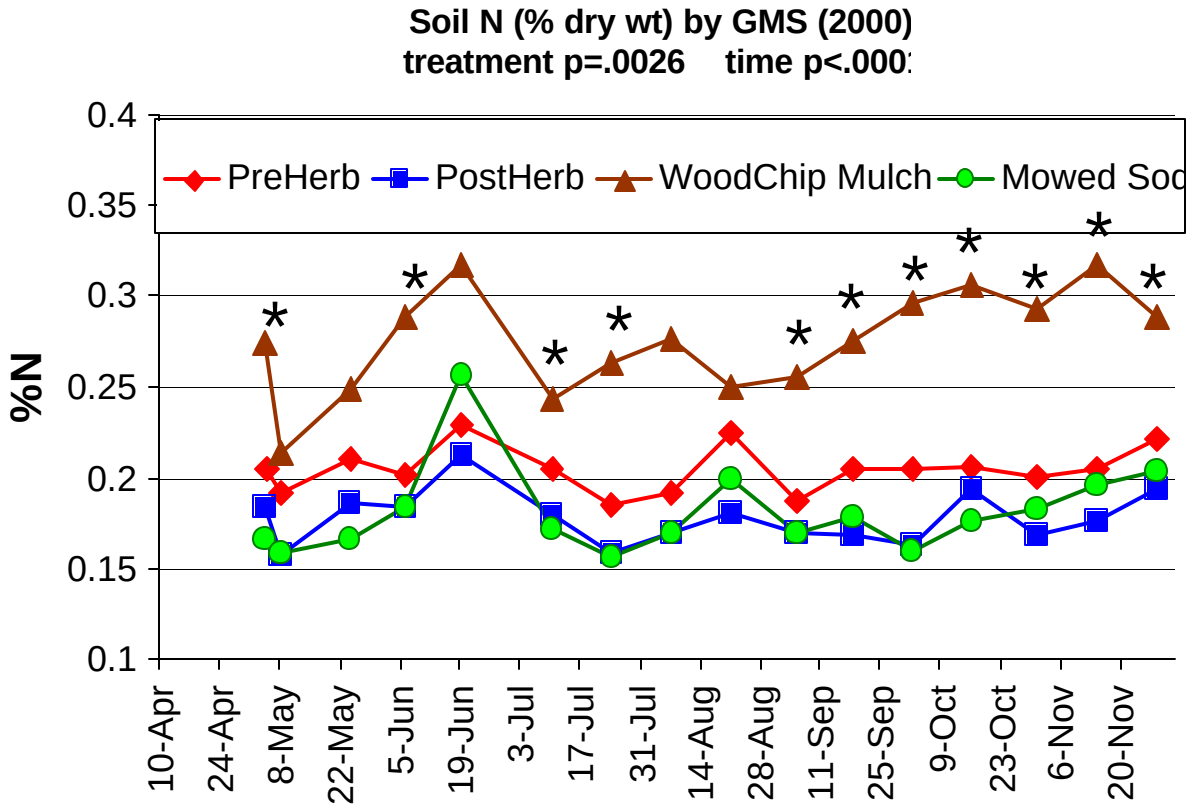

Figure 2. Soil nitrogen content (percent dry weight basis) during the growing season of 2000, after ten years of four different groundcover management systems in a New York orchard.

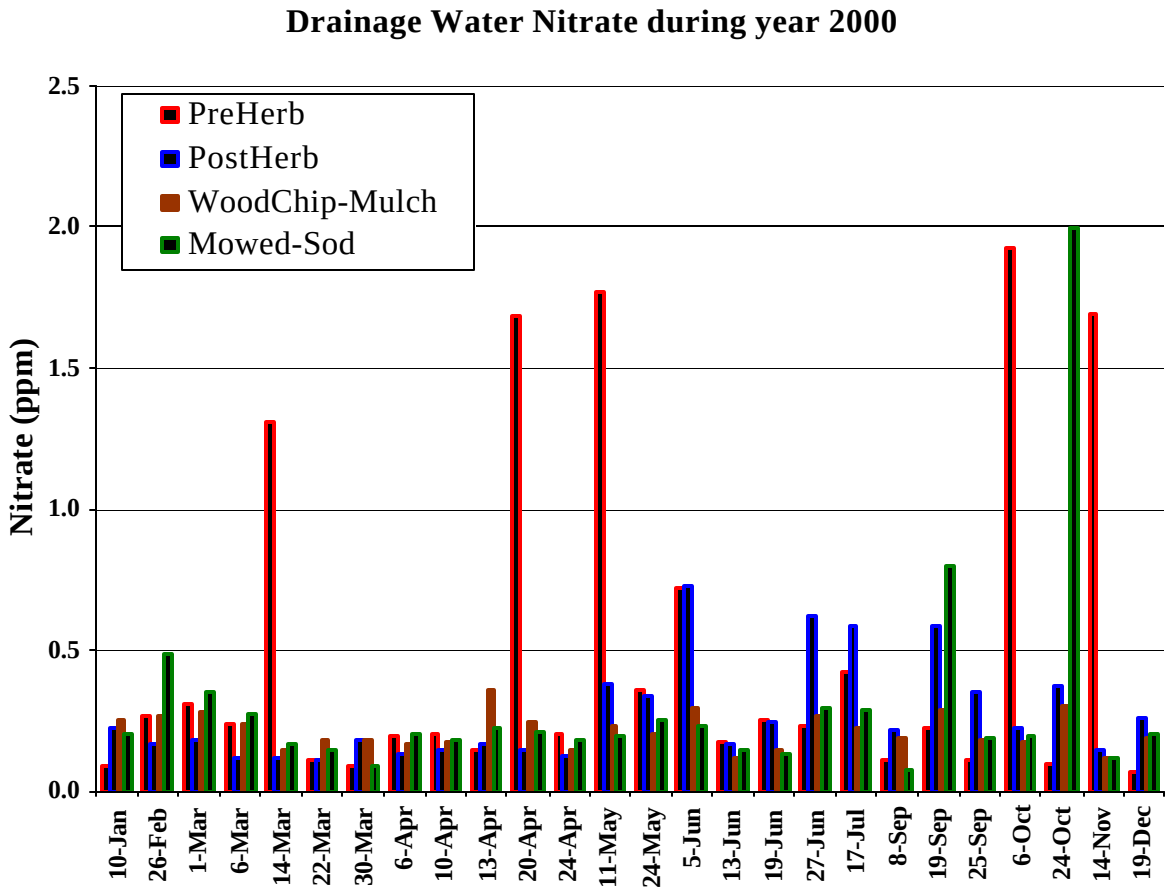

Figure 3. Nitrate-N leachate concentrations averaged by month, in drainage tiles under four different groundcover management systems in a New York orchard during the year 2000

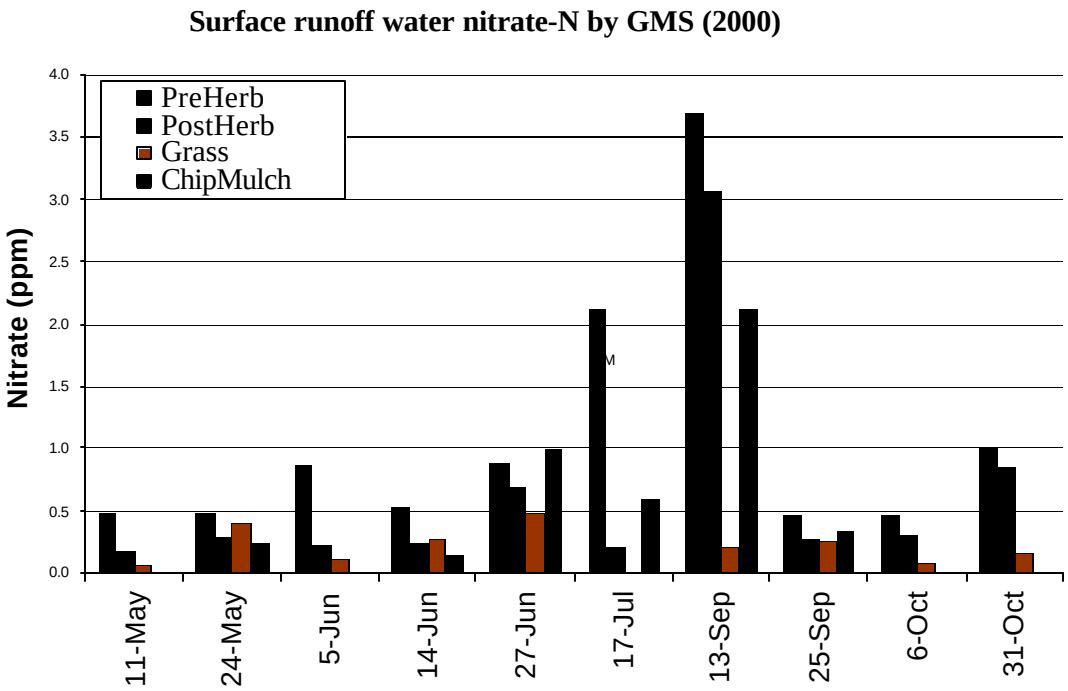

Figure 4. Nitrate-N concentrations in surface runoff water from four different groundcover management systems in a New York orchard during the growing season of 2000.

ORCHARD FOOD SAFETY ISSUES

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No doubt most farmers, including fruit growers, are aware of some of the food safety issues that have 'cropped' up recently. Several food-borne, microbial disease outbreaks have been associated with fresh produce and juice (cider) products in recent years. Fruit growers must remember that they are producing a food, and with that comes a responsibility for taking steps to assure that their apples, cider, small fruit, vegetables, etc. won't make someone—who also happens to be their valued customer!—sick from microbial contamination.

It goes without saying that many steps we already take to bring a quality crop to market also prevent food-borne illness and are just plain common sense. And there is no question eating fruits and vegetable is a healthy act. But in our day-to-day operations of producing a fruit crop we must be vigilant and take positive action to reduce the risk of food-borne illness.

Now, you may say "Why all this fuss? Nobody's ever gotten sick eating my apples or cider!" Well, this may be partially true, but how do you know for sure no one has become sick? In fact, the vast majority of food sickness goes unreported. (Most likely a consequence of dining out!) Also, consider the fact that microbes are evolving, and one in particular, E. coli OH157, is a new, virulent, and hard-to-kill microorganism, Just a few of these bacteria can result in serious illness, particularly in weak individuals such as children and the elderly. So, "Nobody's ever gotten sick eating my fruit!" is NOT a good excuse for ignoring food safety issues.

It's convenient to break the subject of orchard food safety into three areas:

- ***Cider***
- ***Field and production***
- ***Storage, packinghouse, and transportation***

Cider

Cider and fresh juice have been a 'poster child' for the food safety campaign, largely the result of several instances of disease resulting from contaminated cider. The Food and Drug Administration (FDA) and Centers for Disease Control and Prevention have been very active recently in regulating fresh juice and cider production to ensure its safety.

First, in 1998 a labeling rule was imposed by FDA, dictating that a warning label was to be placed on all *unpasteurized* fresh juice. At the same time, pasteurization as a way to kill microbes was promoted. Realizing the inherent limitation of labels—who really reads them?—in preventing further disease outbreaks from contaminated cider, FDA published a 'Final Rule' in 2001 on fresh juice production.

In a nutshell, the Final Rule mandates that processors who wholesale their cider develop and implement a HACCP (Hazard Analysis and Critical Control Points) plan. It's a phased rule, but by 2004, all cider makers who wholesale their juice must have a HACCP plan in place. Developing and implementing a HACCP plan is not trivial, so producers who only wholesale a little may balk and decide to only retail their cider. There are training programs, however, jointly sponsored by FDA and state agencies to make the HACCP process a little less intimidating.

Concerning retailing of fresh cider, apparently farm stands and growers who press cider and retail only are still required to attach a warning label if the cider is consumed off-premises, i.e., sold in plastic jugs. This has prompted many smaller, retail-only producers to purchase UV treatment equipment, which FDA has now approved as a 'kill-step,' thereby exempting their cider that has been UV treated from bearing the warning label.

An interesting aside related to UV treatment is that, according to FDA, UV-treated cider may not be called pasteurized or fresh. But it may be called UV-treated. This is from one of several FDA web sites related to the Final Rule and fresh juice processing. Be sure to check these out (see Resources at end of article) for more information if you are a cider producer and not sure exactly where you fit under the regulations.

All cider makers are also encouraged to use Good Agricultural Practices (GAPs). If you want more information on GAPs and food safety, see the Resources section at end of this article.

All this being said about cider, here is a simple test to gauge your understanding of the situation. Again, see the answers at the end of this article.

1. You make fresh cider without treating it (either pasteurization or UV-treatment) and allow customers to sample it in your store or farm stand -- *do you need to affix a warning label to the single-serve cup or container?*
2. You make cider for your own farm stand and bought a UV-treatment machine to set your mind at ease and for the safety-sake of your elderly and young customers. (Plus, although it's not recommended, you now feel more comfortable using dropped apples in you cider production.) You also have an arrangement whereby another local grower, who does not make his own cider, brings you his apples from which you press cider, bottle it, and send the juice back to the grower to sell in his own farm stand. *Does grower #1 need a HACCP plan?*

Field and production

Enough about cider. Now let's look at some food safety issues related to field production. It's a safe bet growers have not considered some of the not-so-obvious but important sources of field contamination in producing a fruit crop. Here's what to watch out for:

Site Selection -- When establishing a new orchard or berry planting, be aware of the surroundings. Right next to a dairy farm or manure pit is not a good place. Also, consider the upstream water quality and potential for wind contaminants, if they exist. NRCS (Natural Resources Conservation Service) will help you develop a farm plan that is cognizant of food safety siting issues.

Manure -- Although the use of manure in orchards is rare—and for good reason, considering its use has been implicated in several instances of food-borne illness—it still bears mentioning. Ideally, any manure used in fruit production should have been actively composted to destroy most pathogens. If not, there is technically a 120 day PHI (pre-harvest interval) for manure, and care should be made in its application to not touch edible produce. When applied, and if possible, it should be incorporated into soil right away to hasten decomposition, and therefore make contact with produce or handlers less likely. Orchards do not make good cow pastures, and every effort should be made to keep uncomposted manure out of the orchard.

Animals -- In general, it's a good bet to exclude animals from the orchard, particularly near or during harvest. This includes both wildlife and domestic animals, including pets. All have reservoirs of E. coli in their gut and feces. Let's keep them out of the orchard as much as possible. (Another good reason for erecting a deer fence.)

Irrigation -- Modern, high-density orchards and fruit plantings are typically irrigated. GAPs dictate that the source of irrigation water be clean and quality-tested on a regular basis. In general, well water is preferable to surface water from a food safety perspective. And trickle irrigation is preferable to overhead irrigation for one obvious reason—it's less likely to contact the produce. A good idea is to keep records of your irrigation practices and schedule. (More on recordkeeping later.) And, something you may not have thought of, consider your spray water source—is it potable? It should be if applying foliar nutrients or growth regulators close to harvest. It's not a bad idea to even have your spray water tested for biological contaminants.

U-Pick -- Growers running a pick-your-own (PYO) operation have a whole set of food safety issues on their plates, because of the large number of handlers, which of course are their customers, and the lack of complete control over them. (I don't need to tell this to anyone who has been in the U-pick business for any length of time—but you know the customer is always right!) Many PYO orchards and berry farms have been proactive by encouraging and providing hand-wash and toilet facilities for their customers. And most have banned family pets from the fields. If you don't already do so, it's a good idea to clean and sanitize PYO containers. (Do it at least once at the start of harvest season.) And it's not a good idea to sell produce at the farm stand that has been picked by PYO customers.

Worker hygiene -- whenever a fruit is handled, and I mean quite literally 'handled' by the human hand, the potential for contamination exists. This includes harvest labor. Pickers should be cognizant of good personal hygiene, which includes hand-washing. Thorough hand washing—for at least 20 seconds with soap —should be a policy before starting work, and after using the bathroom. Speaking of bathrooms, did you know OSHA requires one bathroom per 20 field workers within 1/4 mile or a five minute walk? Of course hand washing facilities should always be available immediately after using the bathroom.

Storage, packinghouse, and transportation

Worker hygiene in the field is a good segue into post-harvest food safety issues. Here are some things to keep in mind:

Worker hygiene -- is back again as a food safety topic. Of course, frequent hand-washing is a

must for all produce handlers in the packinghouse. Workers should be instructed on proper hand-washing procedures, and it should be monitored and enforced to be effective. Maintaining clean hand-wash and toilet facilities is a good step to making sure your workers (and yourself!) follow the hand-washing rules. Needless to say, sick workers should be sent home or reassigned to a job that does not require produce handling. *Worker hygiene is the golden rule of food safety!*

Packinghouse -- Floors should be kept clean, preferably by being washed, rinsed, and sanitized daily. Of course, no contaminated water or livestock waste should *ever* be allowed in the packinghouse. Did you consider this includes clothes or boots of workers who may have been exposed to livestock waste or similar contamination in the field? Therefore, a good rule is *no* field clothes or boots worn in the packinghouse. Finally, it's a good idea to not allow smoking, eating, or domestic animals in the packinghouse area where produce is being processed, sorted, or packed.

Wash water and packing line -- Those growers and packers who already use wash water are probably already aware of a few good practices. They include: chlorinated water should be used in the dump tank, and chlorine levels in wash water need to be monitored regularly; wash water should be changed regularly; and wash water temperature should be no more than 10 F. cooler than the fruit. (Colder water can actually force contaminants into openings in the fruit, where they are more difficult to kill and a more fertile environment for growth exists.) Packing lines should be cleaned and sanitized on a regular maintenance schedule. And remember to store packing materials in a clean room or shed away from animals.

Storage -- For several reasons, one of which relates to food safety, you don't want to exceed the cooling capacity of your cold storage. Fruit should be cooled as rapidly as possible upon harvest to maintain quality and prevent microbes (if they exist) from multiplying. Storages should be cleaned and sanitized before loading, or at least minimally at the beginning of the storage season, and of course checked for signs of animal activity regularly. Storage bins should also be cleaned and sanitized before use. In the field, ground contact should be avoided. (The practicality of this will be questioned, but the necessity from a food safety standpoint can't be debated.) Don't be too surprised to see the regulated phase-out of wood bins in the orchard in favor of plastic bins, which are far easier to clean and sanitize.

Transportation -- You go to a lot of effort to make sure the apples or whatever fruit you produce are free from microbial contamination from field, to storage, to packing. So make sure the final step, transport to markets, maintains this integrity. If using your own vehicles for trucking, it's up to you to make sure they are clean and have not been used for transporting animals, manure, pesticides, etc., prior to trucking produce. And if you use another shipper, insist that their vehicles are clean and free from debris when picking up *your* produce.

Recordkeeping/Traceback -- If ever an instance of foodborne illness be blamed on your produce, it's important to have documentation of where your fruit came from, how it was produced, and what steps were taken to prevent contamination in processing (if applicable), handling, and distributing . Good documentation of all steps from field to sale is a basic tenet of helping to maintain the cleanliness and safety of your produce, and can't be overemphasized. Good recordkeeping takes discipline, but for many reasons—including food safety—is well worth the effort.

Resources

Here are some important Internet resources to help you comply with fresh juice regulations and analyze your orchard situation with a food safety state-of-mind:

- Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables, http://www.cfsan.fda.gov/~dms/prodguid.html

- New England Extension Food Safety Consortium - GAPs, http://www.hort.uconn.edu/IPM/foodsafety/toc.htm

- FDA's Juice HACCP, http://www.cfsan.fda.gov/~comm/haccpjui.html

- 2002–2003 Pennsylvania Tree Fruit Production Guide, Part VIII. Maintaining the Safety of Pennsylvania Apples and Apple Products, http://tfpg.cas.psu.edu

- Cornell University Good Agricultural Practices Project, Food Safety Begins on the Farm: A Grower's Guide, http://www.gaps.cornell.edu/

- UMass Extension Nutrition Education Program Food Safety, includes "Wash Hands" posters (in nine languages!) as PDF files, http://www.umass.edu/umext/nutrition/programs/food_safety/resources/index.html

Remember -- the key to reducing risks of foodborne illness is preventing contamination BEFORE it happens!

Answers to cider questions:

1. No, you do not need to attach a warning label to cider served as individual servings, whether purchased or as free samples, as long as it is consumed onsite. But, if the intention is for the purchaser to consume it off-premises, then the cider container (whether pints, quarts, half-gallons, gallons, etc.) should have the warning label attached.

2. Yes, the cider producer needs to have a HACCP Plan in place. This transaction is considered a wholesale sale, and therefore the regulation requires a HACCP Plan.

AN UPDATE ON HARVEST AND STORAGE OF HONEYCRISP

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Honeycrisp is an important new apple variety. Storage characteristics have not been of great concern up to now as there has been enough demand for the apple in the fall that not many have been stored. That will change as the many Honeycrisp that have been planted in the past few years come into full bearing. We at the University of Massachusetts have been assessing quality of air stored Honeycrisp for the past five growing seasons, and report here on our findings.

Positive characteristics of Honeycrisp include its flavor and texture and its retention of firmness in storage. It has sold well, and it produces high quality fruit under New England growing conditions.

There are some potential problems as well. The fruit is ready for harvest at about the same time as McIntosh. It may develop soft scald, decay, "off" flavors, and bitter pit in storage. Fruit size and thinning need to be addressed. Also, in our plantings at the University of Massachusetts orchard in Belchertown, there has been variability in fruit characteristics as a function of the tree source.

Time of harvest is an issue for at least two reasons. The competition for harvest of McIntosh may make it difficult to pick both cultivars at the optimum time. Honeycrisp, like McIntosh, can fail to develop its best color until after the optimal harvest time for storing fruit has passed. Succumbing to the temptation to wait for color (or simply not finding time to pick) can result in having fruit which develop excessive storage disorders.

We recommend harvesting Honeycrisp when it has reached 5.5 to 6.0 on the Cornell Generic Starch Chart. September 7 has been a "target" date at the UMass research facility in Belchertown. The color can be less than optimal at this time, and later harvest may be preferred for fruit which will be consumed in the fall. However, if fruit are harvested too late, they are more likely to develop physiological disorders. Soft scald, decay, "off" flavors, and internal browning are some of these potential disorders.

Soft scald appears as a surface browning. As its name suggests, the browned area tends to be soft. It also has a well defined or sharp edge. Soft scald typically develops during the first 60 days of storage and it is later harvested fruit which are susceptible. We have not seen much soft scald on fruit grown at the UMass orchard, but it has been a devastating problem in other areas of the country. Chris Watkins of Cornell University has suggested that delaying cold storage following harvest or storing at 34F rather than 32F will control soft scald. We do have one year's data showing the effect of delayed storage on Honeycrisp and this is shown in Table 1.

Decay is perhaps the most serious of the storage disorders of Honeycrisp grown in our area because it is the disorder for which there is seemingly no adequate solution. Up to 30% of some of our research sample fruit have developed decay during 5 months of cold storage. Decay is often related to stem punctures and bitter pits which can be controlled, but even so, there is still significant decay which occurs. Decay is one disorder which is not substantially reduced by early harvest.

Bitter pit development does not appear to be related to time of harvest, but it is interconnected with postharvest decay. At the time of harvest in 2002, 7% of apples in a sample of harvested Honeycrisp had bitter pit. After 90 days in 32F air storage, 13% of apples had bitter pit. Following 5 months of cold storage and one week at room temperature, fruit were rated for bitter pit and decay, and the combination of the two. Some fruit had been discarded at 90 and 150 days because of decay, but of the fruit remaining at 157 days, 73% of those with decay also had

bitter pit. Thus it appears that controlling bitter pit would substantially reduce decay. Application of calcium sprays during the growing season and avoidance of high nitrogen situations are two actions which will reduce bitter pit.

Table 1. Percent of fruit developing soft scald during the first 60 days of 32F cold storage.

Harvest Date	Days at room temperature before cold storage			
	none	1 day	4 days	6 days
9/21/00	0	0	0	0
9/26/00	34	5	1	0

Fruit size is a factor in bitter pit development, as well as a factor influencing other storage disorders. Larger fruit do tend to be lower in calcium and develop more bitter pit. Large fruit are often softer than small fruit, but in one Honeycrisp study in 1998 the small fruit from heavily set trees was softer than the larger fruit from trees with more moderate set. Soluble solids were higher on the fruit from trees with lighter set, and flavor was judged to be superior. Size can be a mixed blessing as shown in Table 2. Chemical thinning has been effective on Honeycrisp (Sevin™ at 1/2lb ai/100 gal at 2X was used at petal fall in 2002). It should be noted that Honeycrisp can become a biennial bearer.

Table 2. Effects of crop load on Honeycrisp apples grown at UMass' orchard in Belchertown, 1998

	Light set	Optimal set	Heavy set
Fruit size	252 g	229 g	158 g
Soluble solids at harvest	14.1 %	12.1 %	10.6 %
Firmness at harvest	17.6	16.2	15.5
Bitter pit after storage	33 %	21 %	6 %
Decay after storage	22 %	18 %	4 %

One last concern about Honeycrisp is that the fruit coming from different areas/trees within the orchard may not be as alike as one might expect fruit of the same cultivar to be. Table 3 shows some of the block-to-block variation observed in the 2002-2003 harvest and storage season. These differences may be due to budwood source, rootstock, tree age, soil differences (the blocks are close to one another), or, most likely, a combination of all.

It was usually possible to guess which group of trees an apple came from just by looking at it. The NE183 fruit were the brightest and smoothest. The Block A fruit tended to start out striped and develop a deeper red than the NE183 fruit. The block E fruit were very prone to bitter pit and seemed slightly more elongated. Trees in Block A are on M9 rootstock, and came from NY State Fruit Testing in 1994. The Block E trees which were planted in 1989 and are on M26 rootstock came from the Minnesota program which developed Honeycrisp. The NE183 trees were planted as part of a multistate research project in 1995. They are on M9 rootstock and

came from Adams County Nursery in Pennsylvania. These are all reputable sources of plant material, but the fruit are clearly different, more different than might be expected from trees in nearby blocks. Some differences may be related to differences in ripening. For example, the starch score of the later NE183 harvest indicates that the fruit were overripe. Overripe fruit might well be more prone to developing internal browning at harvest. Only 2% of Block A fruit harvested September 5 and 10, 2002 developed internal browning even after 5 months of 32F air storage. Some differences are harder to explain. There was no size difference at all in the 9/16 harvest, yet the ripest fruit (NE183) were also the firmest.

Table 3. Differences in late-harvested Honeycrisp apples from three sources at the UMass research facility in Belchertown, MA, 2002.

	Harvest Date	Block A	Block E	NE183	Significance[z] of:	
					Harvest	Block
Grams per fruit	9/16	237	235	236	ns	ns
	9/23	240	277	184		
Red color, percent of surface	9/16	64	46	70	*	***
	9/23	69	64	76		
Firmness at harvest (lbs)	9/16	14.9	14.5	16.8	***	***
	9/23	14.4	13.1	14.8		
Starch index[y]	9/16	6.7	6.5	7.0	***	***
	9/23	7.4	7.0	8.0		
Internal browning[x] at harvest	9/16	0	0	0	***	***
	9/23	0	0	60		
Internal browning[x] following storage	9/16	4	19	16	***	ns
	9/23	38	41	53		
Bitter pit[x] following storage	9/16 & 9/ 23	7	33	12	ns	***

[z] ns, *, ***, = not different at odds of 1:20 or statistically different at odds of 1:20 or 1:1000, respectively.
[y] Starch index according to the Cornell Generic Starch Chart
[x] refers to percent of fruit in the sample which developed the disorder

Grow Honeycrisp! Honeycrisp is an apple taht consumers ask for. Harvest at a starch score of 5.5 to 6.0. Do not wait too long for color. Early harvested fruit are unlikely to develop internal browning, soft scald, or “off” flavors. Apply calcium. Sufficient calcium will control bitter pit, which will in turn reduce decay. If you do harvest late, don’t store the fruit, and do cut a subsample of fruit to make sure they haven’t developed internal browning, and taste a subsample to make sure they haven’t developed an “off” flavor.