Agricultural Land-Use Change and Local Context: The Shenandoah-Cumberland Valley Apple-Growing District in the Eastern United States

A Dissertation Presented for
The Doctor of Philosophy Degree
The University of Tennessee, Knoxville

Joseph Paul Guttmann
August 2012

Copyright @ 2012 Joseph P. Guttmann
All rights reserved

ACKNOWLEDGEMENTS

Over the years that it took to complete this dissertation, I accrued a long list of people to whom I owe a debt of gratitude for their assistance and moral support. First and foremost, I thank my parents, Paul and Elaine Guttmann. It was their Christmas gift of a globe and atlas when I was in the first grade that inspired my love of geography. My parents have encouraged and supported me 100 percent through the trials and joys of life. Their financial assistance enabled me to conduct this research and allowed me to focus on writing. Both parents spent countless hours assisting me with word choices, editing, and formatting this paper. They now know more about the apple industry than they ever cared to know. One could not have better parents and I am truly honored to be their son.

Advancing to a doctoral program did not happen in a vacuum. I was fortunate to have excellent teachers all the way up the educational ladder. A few teachers need to be singled out for extra praise. Mrs. Baker placed me in the highest reading group in third grade while Mrs. Miale challenged me in fifth grade. In eighth grade, Tana Petrucci was a young teacher who saw my potential and recommended me for the gifted program. Once in the gifted program, Harriet Kopp prepared me for college. Dr. James Barefield gave me the opportunity to spend a semester in Venice, Italy and he was my most influential professor while at Wake Forest University. Other key figures include Dr. Mack Gillenwater, the first person to encourage me to attend a doctoral program, and Dr. Christa Smith, who provided an opportunity for me to gain full-time teaching experience at Clemson University.

I would never have completed this dissertation without the guidance of my advisor, Dr. Thomas Bell. Dr. Bell offered encouragement when I needed it the most, timely editing, and went to bat for me when I needed time extensions from the graduate school. I appreciate his patience. In addition, I am grateful for his willingness to continue to work with me after his retirement and his move to Kentucky.

I would also like to thank my other committee members ï Dr. Ronald Kalafsky, Dr. Henri Grissino-Mayer, and Dr. Dayton Lambert ï for their time and suggestions that improved this dissertation. Dr. Lambert from the Agricultural and Resource Economics department went above and beyond the call of duty for an outside advisor by devoting much of his time to perfect the proposal. A special thank you goes to Dr. Henri Grissino-Mayer for his willingness to be a late addition to my committee, his thoroughness in reading and correcting the manuscript, and keeping me on-track with the graduate school paperwork. Unfortunately, his presence on the committee was necessitated by the unexpected passing of Dr. John Rehder. Dr. Rehder was a fine scholar, a friend, and an overall good guy. He is missed.

Two other ñhonoraryò committee members have also earned my gratitude: Dr. Charles Aiken and Dr. Margaret Gripshover. Although he retired before I was advanced to candidacy for my Ph.D., I wrote my first paper about the impact of development on the orchard industry in the Eastern Panhandle of West Virginia for Dr. Aiken's Rural Geography seminar course. That paper served as the foundation for this dissertation project. I first took a geography class from Dr. Gripshover when I was in a masters of teaching program at Marshall University. Four years later, I possessed a masters degree

in geography and followed her to the University of Tennessee. She has been an excellent mentor and her best advice was to pick a topic that would hold my interest for the duration of the dissertation process. Dr. Gripshover and Dr. Bell have also opened their home and cooked special dinners numerous times for me and other graduate students who could not make it home for the holidays.

In addition to my committee and honorary committee members, many other people at the University of Tennessee deserve praise. Both Jack Williams and Will Fontanez transformed my ideas into polished products. Jack Williams, at the University of Tennessee Print Shop, helped with the design, formatting, and packaging of the mail survey. I believe the attractive, professional appearance of the survey was instrumental in obtaining a high return rate. I spent multiple days working one-on-one with Cartography Lab Director Will Fontanez on the maps. I appreciate his time and patience.

Over the course of my stay in the geography department, many of my fellow graduate students offered their help and friendship. I would like to especially thank Claire Jamieson, Amy Hill, and Michelle Brym for their practical advice and moral support. I am indebted to Charlynn Burd for helping me with the design and wording of the survey. The fine dissertations of Kendrick Curtis and Sara Beth Keough were used as models. Thanks also go out to faculty members Dr. Ronald Foresta, Dr. Sally Horn, Dr. Carol Harden, Dr. Shih-Lung Shaw, Dr. Lydia Pulsipher, and Dr. Madhuri Sharma for their kind words of encouragement through the years.

Finally, my dissertation could not have happened without the help of the growers and the others associated with the apple industry. When I started this project, I did not

know much about the apple industry. I was amazed at the willingness of people to go out of their way to help an outsider learn about their livelihoods. Many people took time out of their busy schedules to sit down for an interview or to fill out the mail survey. The interview of Dr. Rich Marini, the head of Penn Stateôs department of horticulture, lasted for over three hours! I was invited into homes, to go on field trips, and to growersô meetings. Two growers, who asked not to be named, even gave me tours of their orchards. Most instrumental of all were Dr. Stephen Miller of the USDA Appalachian Fruit Research Station, Bill Bennett of the USDA Farm Service Agency, and Dr. Tara Baugher of Penn State University Extension Service. They always went the extra mile to provide me with information.

ABSTRACT

Across the United States, the rural-urban fringe continues to be a place of dynamic land-use change. One area that has experienced a change in its agricultural base is the Shenandoah-Cumberland Valley Fruit District of Pennsylvania, Maryland, West Virginia, and Virginia. Since 1982, apple acreage in the Fruit District has declined by nearly 50 percent. Using a mail survey and personal interviews, this dissertation investigates the factors behind the Fruit Districtôs 25-year decline in apple acreage, the reasons why this decline has not been spatially uniform across the Fruit District, and the ways that growers have adapted to ensure the future economic viability of their orchard operations. Growers have stopped producing apples because of a myriad of reasons operating on different scales ranging from the macro and regional to the individual farm-level. Results indicate that factors such as an extended time period of low apple prices, competition from foreign and other U.S. apple-growing districts, and the lack of having a known successor for their farm upon retirement all play prominent roles in a growerôs decision to exit apple production. Grower decisions have also been impacted by locally-derived growth and development and the continued outward spread of the Washington D.C.-Baltimore metropolitan area. Negatively influencing reinvestment decisions, evidence of the presence of an impermanence syndrome was detected in some areas of the Fruit District. Many growers have responded to the economic challenges by making orchard management decisions to increase per acre tree densities and by shifting a higher percentage of their apple crop from the processing market to the fresh wholesale and direct-to-consumer markets.

Table of Contents

CHAPTER 1 : INTRODUCTION AND RATIONALE FOR THE STUDY 1
Introduction 1
Rationale for Study 5
Purpose 9
Organization of the Dissertation 10
CHAPTER 2 : LITERATURE REVIEW 12
Models of Urban Growth 12
Agriculture in the Rural-Urban Fringe 17
Land Markets 17
Selling Out 20
Agricultural Adaptation ï Intensification 21
Agricultural Adaptation ï De-intensification 25
Hobby Farms 26
Direct Marketing 27
Farm Trajectories 29
Marginal Land 31
Land-use Policies 32
Agricultural Issues at the Macro-scale 36
Labor 36
Marketing Channels 37
Government Involvement 40
Supply and Demand 43
Devolution of Agricultural Districts 45
Decision-making in Agriculture 47
Farm Exits 52
CHAPTER 3 : THE SHENANDOAH-CUMBERLAND VALLEY FRUIT DISTRICT 59
A Brief History 61
Other Agriculture Pursuits Within the Fruit District 67
Sub-Regions of the Shenandoah-Cumberland Valley Fruit District 69
Adams County 72
West Virginia 78
Virginia 82
Cumberland Valley 90
CHAPTER 4 : METHODS 95
Survey Design 95
Survey Implementation 101
Interviews 109
Participatory Events 110
CHAPTER 5 : MACRO-SCALE ISSUES IN THE APPLE INDUSTRY 114
A Year in the Life of an Apple Orchard 114
Trends in the U.S. Apple Industry 120
Higher Tree Densities 120

Technological Innovations 128
New Apple Varieties 133
Marketing Clubs 138
Heirloom Apples 142
Production, Price, and Consumption Trends 143
Fresh-Cut Apple Slices 149
Organic Apples 152
Buy Local 155
Competing U.S. Apple-Growing Regions 162
Washington 164
New York 170
Michigan 173
Other Districts 175
Foreign Trade 176
Imports 178
China 179
Export 183
The Processing Industry 186
Large Apple Processors of the Fruit District 192
Competition 195
Government and Associations 199
Government 199
Associations 205
Key Findings from Chapter Five 209
CHAPTER 6 : REGIONAL ISSUES CONFRONTING THE APPLE INDUSTRY IN THE SHENANDOAH-CUMBERLAND VALLEY FRUIT DISTRICT 212
Urban Growth Pattern 212
Impact of Area Growth and Development on the Fruit Industry 224
Effects of the Economic Recession 245
A Comparative Advantage Lost 248
The Apple Industryôs Impact on Regional Identity 252
Regional Integration 257
Labor 263
Key Findings for Chapter Six 279
CHAPTER 7 : FARM LEVEL FACTORS IN THE DECISION TO CONTINUE OR EXIT APPLE PRODUCTION 281
Grower Demographic Profiles 282
The Farms 289
Fresh Market Wholesale 300
Other Wholesale Opportunities 306
Processing Market 307
Direct Marketing 314
Examples of On-the-Farm Retail from the Eastern Panhandle 326
Farm Reinvestment 331

Farm Succession 334
Young Growers Alliance 336
Past Farm Investments 340
Future Farm Investment Plans of Current Growers 344
Rating the Importance of Factors Contributing to the Decision to Exit Apple-Growing 350
Key Findings for Chapter Seven 356
CHAPTER 8 : DISCUSSION 359
What Factors are Behind the Fruit District's 25-year Decline in Apple Acreage? 359
Why Has the Apple Acreage in Some Areas of the Fruit District Declined Faster than Others? 366
What Management Practices Have Remaining Growers Adopted to Keep Their Operations Viable? 372
Future Outlook of the Fruit District 374
Future Threats 374
Future of the Marketing Outlets 384
Final Thoughts on the Future of the Shenandoah-Cumberland Valley Fruit District 390
BIBLIOGRAPHY 393
APPENDIX ONE: THE MAIL SURVEY 441
APPENDIX TWO: THE PRE-NOTICE LETTER 455
APPENDIX THREE: COVER LETTER SENT WITH SURVEY 457
APPENDIX FOUR: REMINDER POSTCARD AND THANK YOU POSTCARD 460
APPENDIX FIVE: COVER LETTER SENT WITH THE SECOND MAILING OF THE SURVEY 462
APPENDIX SIX: THE WEBSITE 464
APPENDIX SEVEN: INTERVIEW CONSENT FORM 467
APPENDIX EIGHT: A CLOSER LOOK AT KNOUSE FOODS 471
VITA 477

List of Tables

Table 2.1 Farming Food Chain 22
Table 3.1 Largest Industrial Employers in Berkeley County and Winchester, VA Mid-1920s 62
Table 3.2 Statewide Commercial Apple Acreage Located in the Shenandoah - Cumberland Valley Fruit District 65
Table 3.3 Shenandoah-Cumberland Valley Fruit District Apple Acreage 65
Table 3.4 Statewide Apple Production (million lbs.) 67
Table 3.5 Value of Agriculture, by County (2007) 68
Table 3.6 Comparison of Shenandoah-Cumberland Valley Fruit District Sub-Regions 71
Table 4.1 Survey Response Rates by State 107
Table 5.1 Average Apple Yield per Acre 2007ï 2009, Select States 124
Table 5.2 Growers Reporting High-Density Plantings 125
Table 5.3 Historical U.S. Apple Production by Variety 134
Table 5.4 Top Five Apple Varieties Planted in Pennsylvania, by Percentage 2006ï 2008 135
Table 5.5 Average Washington Packinghouse Shipping Price for Select Apple Varieties, 2011 139
Table 5.6 United States Production, Per Capita Consumption, and Average Prices for Apples, 1984ï 2009 145
Table 5.7 Top Six States ð Apple Acreage, Production, and Yield 162
Table 5.8 Average Fresh Market Production by State, 2007ï 2009 163
Table 5.9 Average Processing Market Production by State, 2007ï 2009 164
Table 5.10 Apples Utilized for Juice or Cider Production by State, 2004ï 2006 169
Table 5.11 Apples Utilized for Applesauce or Other Canned Production, 2004ï 2006 169
Table 5.12 Apple Acreage and Population Change in Select Eastern Apple Districts 171
Table 5.13 Top Apple Varieties by Percentage of Acres in Each State 190
Table 5.14 Survey Question: Who do you feel is your main source of competition? 199
Table 6.1 Shenandoah-Cumberland Valley Fruit District Population Trends 214
Table 6.2 Demographic Comparisons between Select Suburban Counties of Washington, D.C. and Select Fruit District Counties, 2005ï 2009 217
Table 6.3 Number of Commuters from Select Shenandoah-Cumberland Fruit District Counties to Washington-Baltimore Metro Area Census 2000 219
Table 6.4 GrowersôRating of Development Pressures over the Past 15 Years 226
Table 6.5 Fruit District Sub-Region Population and Apple Acreage Change 2000ï 2010 226
Table 6.6 Survey Question: How has development in your area impacted your business? 235
Table 6.7 Survey Question: If you lease land from others, how concerned are you in maintaining long-term access to that land parcel? 237
Table 6.8 Survey Question: If you decide to sell your farm in the future, what is the likelihood that the land would continue to be used for agriculture? 238
Table 6.9 Survey Question: If you are a former grower or a current grower who has sold a significant amount of land, what was the land used for after it was sold? 240

Table 6.10 Survey Question: How has the current financial crisis influenced your decision making? 247
Table 6.11 Interactions Between Growers in the Different States of the Shenandoah-Cumberland Valley Fruit District 261
Table 6.12 Grower Statements on the Labor Situation 265
Table 6.14 Growth of the Hispanic Population in the South Mountain Fruit Belt of Adams County, Pennsylvania, 1990ï 2010 278
Table 7.1 Percentage of Respondents who Produced Apples in 2009, by Sub-Region .. 283
Table 7.2 Percentage of Current Growers in the Following Age Groups 284
Table 7.3 Growerôs Educational Attainment 285
Table 7.4 Employment Situation of Current Growers 287
Table 7.5 Percentage of Current Growers who Earn at Least 75 Percent of their Annual Taxable Income from Farming 288
Table 7.6 Total Apple Acres Reported by Survey Respondents 290
Table 7.7 Average Size of Farm by Sub-Region 291
Table 7.8 Survey Question: Approximately how many total acres do you have planted in apples? 291
Table 7.9 Shenandoah-Cumberland Valley Fruit District Operations Listed Among the Nationôs Top 25 Apple and Pear Orchards by Acreage 293
Table 7.10 Crop Diversification Among Apple Growers in the Fruit District 295
Table 7.11 Peach Acreage by County 298
Table 7.12 Survey Question: What percentage of your apple crop is sold on the fresh wholesale market or to a grocery store? 302
Table 7.13 Percentage of Growers Who Produce Specifically for the Processing Market 302
Table 7.14 Survey Question: In the next five years, do you expect the percentage of your apple crop that you sell to the following markets to 304
Table 7.15 Percentage of Current Growers who Expect to Increase their Fresh Market Wholesale Sales in the Next Five Years by Sub-Region 304
Table 7.16 Survey Question: What percentage of your apple crop do you sell to processors? 308
Table 7.17 Percentage of Statewide Apple Production Used for Processing 314
Table 7.18 Survey Question: What percentage of your apple crop is retailed on the farm, at farmersô market, or through other direct marketing outlets? 321
Table 7.19 Percentage of Growers Who Use the Following Direct Market Outlets 323
Table 7.20 Survey Question: Are you generally optimistic or pessimistic about the future of apple growing in your area? 333
Table 7.21 Survey Question: How important is maintaining your lifestyle of working on the farm? 333
Table 7.22 Survey Question: Do you expect a son, daughter, other relative, or close associate to eventually take over the operations of your farm? 336
Table 7.23 Growers Reporting Changes in Apple Acreage Within the Past 15 Years ... 341
Table 7.24 Changes in Apple Acreage by GrowersôFarm Succession Expectations and GrowersôOutlook on the Future of Apple Growing in the Area 342

Table 7.25 Survey Question: When was the last time you planted new trees? 343
Table 7.26 Growerôs Expectations of Apple Acreage Change on Their Farm over the Next Five Years 344
Table 7.27 Survey Question: In the next five years, do you expect to make any of the following capital improvements? 346
Table 7.28 Grower Plans in the Next Five Years 347
Table 7.29 Average Ratings of the Degree of Difficulty Growers have had Coping with the Challenges Facing the Fruit District 351
Table 7.30 Average Grower Ratings of the Level of Importance the Following Factors have on the Decision to Stop Growing Apples 353
Table 8.1 Apple Acreage Change in Major U.S. Apple Districts 1997-2007 361
Table 8.2 Differences Between Adams County and the Northern Shenandoah Valley, Part I 368
Table 8.3 Differences between Adams County and the Northern Shenandoah Valley, Part II 371

List of Figures

Figure 1.1 The Final Auction....2
Figure 1.2 The Shenandoah-Cumberland Valley Fruit District....3
Figure 3.1 Physical Regions of the Shenandoah-Cumberland Valley Fruit District....60
Figure 3.2 Sub-Regions of the Shenandoah-Cumberland Valley Fruit District....70
Figure 3.3 Map of Adams County....74
Figure 3.4 Example of a Medium-Sized, On-the-Farm Packinghouse in Adams County 75
Figure 3.5 Apple Industry Infrastructure of Adams County, PA....77
Figure 3.6 Map of the West Virginia Sub-Region....79
Figure 3.7 Map of the Virginia Sub-Region....83
Figure 3.8 Aerial Map of the Winchester (VA) Apple Complex....88
Figure 3.9 Winchester Apple Complex....88
Figure 3.10 Map of the Cumberland Valley Sub-Region....91
Figure 5.1 Orchard Wind Machine....116
Figure 5.2 Examples of Tree Rootstocks and Planted Densities....122
Figure 5.3 Examples of New Orchard Technologies....129
Figure 5.4 Supermarket Promotion of ñLocalò Fruit....159
Figure 5.5 York Imperial Apples....189
Figure 5.6 Major Brands of the Fruit District Apple Processors....193
Figure 5.7 Research Projects at the USDA Appalachian Fruit Research Station....203
Figure 6.1 Spatial Relationship and Commuting Zones of the Shenandoah-Cumberland Valley Fruit District and Washington-Baltimore Metropolitan Area....216
Figure 6.2 Building Permits for New Privately-Owned Residential Housing Units....227
Figure 6.3 New Residential Development in the Orchard Areas of the West Virginia Sub-Region....229
Figure 6.4 Map of Orchard Land-Use Change in Northern Berkeley County, West Virginia....230
Figure 6.5 Grower-Neighbor Relations....243
Figure 6.6 Closed Plant....244
Figure 6.7 Map of Orchard Loss in the Appalachian Ridge and Valley Province....249
Figure 6.8 Symbols of Regional Identity....253
Figure 6.9 Musselman High School....254
Figure 6.10 Berkeley Springs Apple Butter Festival....255
Figure 6.11 The Apple Trail....256
Figure 6.12 A Jamaican Apple Harvester....270
Figure 6.13 Migrant Housing Patterns....276
Figure 7.1 Diversification of Fruit Crops....296
Figure 7.2 A Processing Orchard....309
Figure 7.3 On-The-Farm Retail....317
Figure 7.4 FarmersôMarket in Washington, D.C....324
Figure 7.5 Examples of On-The-Farm Retail in the West Virginia Sub-Region....329
Figure 7.6 Young Grower Alliance Field Trip....338
Figure 7.7 Orchard Land For Sale....348
Figure 8.1 Brown Marmorated Stink Bug Injury....380

CHAPTER 1: INTRODUCTION AND RATIONALE FOR THE STUDY

Introduction

The last crop is picked and hauled to the processor. The bulldozers arrive, knocking down the still productive trees and pushing them into piles. Test trenches for water percolation are dug. Yellow-taped surveying stakes demarcate new property lines. On land that was once passed down through several generations, a new sign proclaims ñApple Banks South - A Premier Development, 2-4 Acre Homesites, Starting in the Upper $600,000s.ò

Across America, changes in the functional structure of the metropolis are being felt far from the city center in suburban and exurban areas that were previously dominated by agriculture or other rural uses. As employment poles shift to the suburbs, areas formerly outside the central cityôs commuter shed are within reasonable reach of these new growth areas (Muller 1981;Garreau 1991; Lewis 1995; Olson 1999). Outward spatial growth of metropolitan areas is fueled by the demand for open spaces and cheaper land in the rural-urban fringe (Brown *et al*. 1981; Capozza and Helsley 1989; Wolpert and Danielson 1991; Davis and Nelson 1994; Heimlich and Anderson 2001). Rising demand for new housing, commercial space, and industrial needs have increased agricultural land values, forcing many farmers to contemplate their future in that endeavor. The cumulative effects of individual decisions made within the free market economy are reflected in the dynamic changing landscapes of the rural-urban fringe (Harvey 1966; Sinclair 1967; Libby and Stewart 1999; Heimlich and Anderson 2001). It

is this dynamism that has inspired geographers and other scholars to explore the processes involved in the conversion of agricultural land to urban use.

One area that has experienced changes in its agricultural base is the Shenandoah-Cumberland Valley Fruit District of Pennsylvania, Maryland, West Virginia, and Virginia. Both locally-derived growth and increasing interdependence within the Washington-Baltimore metropolitan region mean that even a high-value crop like apples appears to be struggling to survive in the face of development pressures. In the past 25 years, the Fruit Districtôs apple acreage has declined by almost 50 percent (USDA NASS 2009a). In many cases, apple orchards have been replaced by new housing developments with idyllic names such as Georgetown Orchards and Apple Knolls Estates (Figure 1.1; Figure 1.2).



Figure 1.1 The Final Auction

Left ï Auctioning off the orchard equipment in 2004 *Right* ï The housing development that replaced the apple orchard; Berkeley Co. WV

Photographs by Joseph P. Guttmann

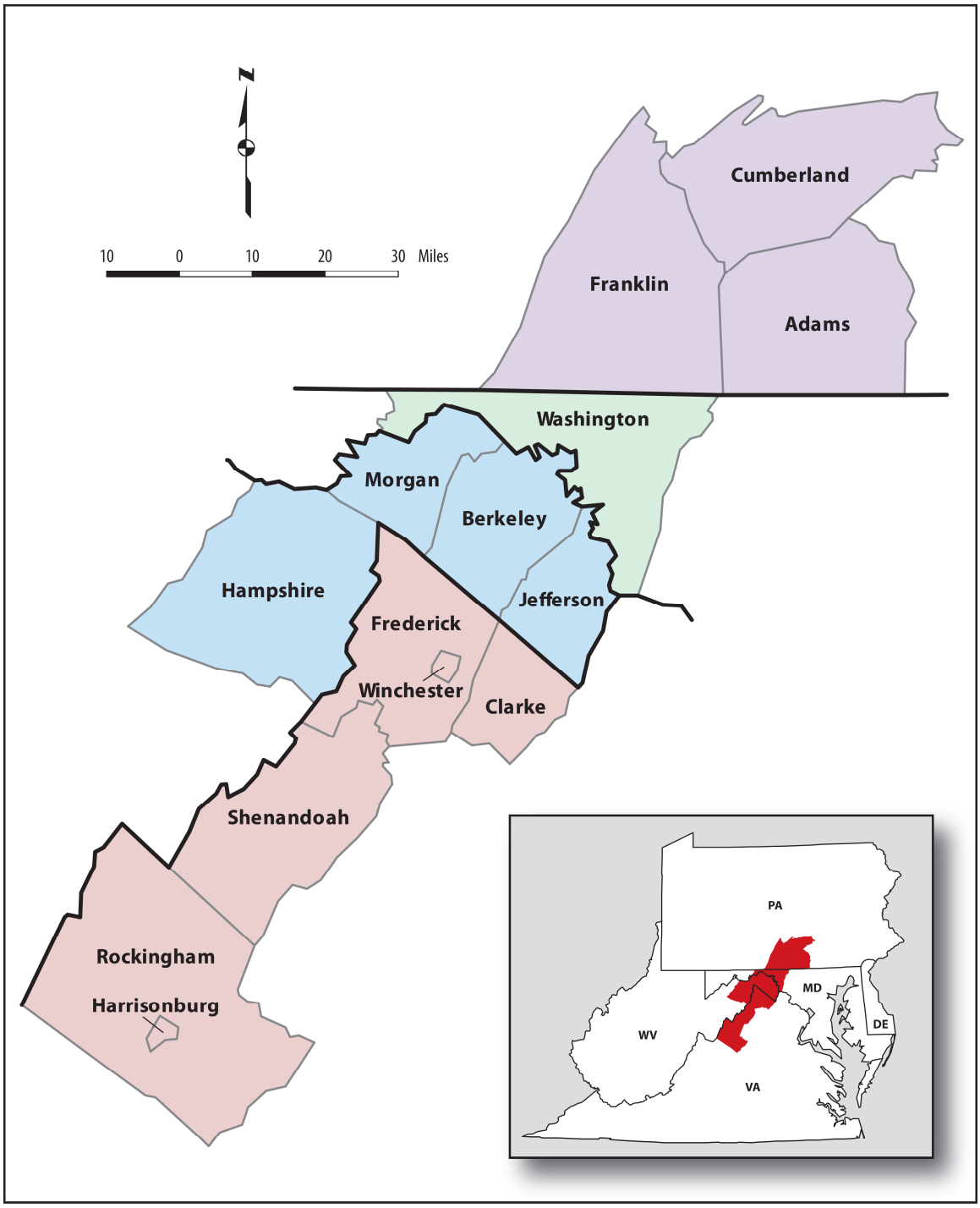


Figure 1.2 The Shenandoah-Cumberland Valley Fruit District

Map by Will Fontanez

Like all farmers on the rural-urban fringe, growers in the Shenandoah-Cumberland Valley Fruit District are not just confronted with land market challenges, but must deal with an array of other structural forces that impact the agricultural sector. Geographer Christopher R. Bryant proposed that farmersô decisions are influenced and constrained at three different scales ï macro, meso, and micro (Bryant 1984; Bryant and Johnston 1992). Macro-level factors range from federal agricultural policies, global competition, and the state of the economy, to long-term structural changes in the agriculture sector. Land values, local land policies, and local labor markets are three important regional or meso-scale issues, a scale that would also include changes within the rural-urban fringe. Finally, important factors at the farm-level or micro-scale include the type and size of farm, the farm familyôs demographic profile, and personal attributes such as management skills and risk tolerance.

While multiple factors at different scales influence farming decisions, previous studies have tended to limit their focus to one scale with only a passing mention of the others. Relying on a singular scale, the researcher might overlook or underrate important variables in land-use decisions. Using Bryantôs work as a framework, this study will take a multi-scale, comprehensive approach to address the question of why apple acreage in the Shenandoah-Cumberland Valley Fruit District has declined dramatically in the past 25 years. Because this decline has not been spatially uniform, this study will also determine why some areas in the Shenandoah-Cumberland Valley Fruit District have declined at a faster rate than others. Finally, I will examine the management practices

growers have adopted to maintain their economic viability within changing global and local markets.

Rationale for Study

The apple industry is ideal for measuring the effects of urbanization on agriculture at the regional or meso-scale. Apple production is both labor-intensive and capital-intensive. Because apples need to be hand-picked to prevent bruising, apple-growing is a seasonally labor-intensive crop with wages typically accounting for at least one-half of a farmôs annual costs. Apple production is also capital-intensive because of the amount of money required to produce an annual crop as well as the amount of capital tied up in long-term investments. For example, todayôs semi-dwarf trees take four-to-five years before the trees start to produce marketable apples. That means there are four-to-five years of paying for orchard maintenance, land taxes, and interest payments with no return on the investment (Blank 1998; Bennett 2004).

Once producing, the apple offers high returns per acre, but often cannot compete with the value of the land for urban uses. For example, in the Shenandoah Valley in 2004, a grower could gross before expenses $1,500-$2,000 per acre for processing apples and $4,000 for fresh apples sold on the wholesale market while farmland for conversion was selling at $24,000 per acre (Bennett 2004; Source 3170 2004). It is hypothesized that the farmerôs perception of the uncertain but eventual inevitability of urbanization creates a situation where operations requiring long-term investment horizons will suffer the most from the ñimpermanence syndromeò (Clawson 1962; Sinclair 1967; Lockeretz *et al*. 1987; Hart 1991). This syndrome or feeling creates a reluctance to reinvest in

operations like dairy farms and orchards if farmers are pessimistic about long-run prices, nearing retirement and lack a successor, and/or expect to sell the land before amortization of new investments (Berry 1979; Pillsbury and Florin 1996; Zollinger and Krannich 2002; Bragg and Dalton 2004).

Because farmers may not respond in the same way to the same set of stimuli, one way to determine the relative importance of factors at the various scales is to ask the farmers directly (Bryant 1981; Bryant and Johnston 1992). Examples of studies that use farmer surveys or interviews to assess farmersô attitudes towards exiting agriculture and urban pressures include Bryant (1981), Lockeretz *et al*. (1987), Zollinger and Krannich (2002), Fitzgerald (2003), Bragg and Dalton (2004), and Jackson-Smith *et al*.(2008). These studies recognized that while structural forces may constrain options, it is the rational and sometimes seemingly irrational decisions based on each individual farmerôs perceptions that determine the landscape (Harvey 1966; Jackson-Smith *et al*. 2008). Of particular relevance is Fitzgerald (2003). His analysis of the changes occurring in the Nelson apple district of New Zealand is similar to the goals of this dissertation. He found that rising production costs were encouraging smaller growers either to increase their economies of scale or to exit the industry. Unwillingness to make the lifestyle changes needed to intensify their operations and the ability to sell land in an urbanizing area were reasons behind some exits.

Often, studies categorize farmers into those expecting to exit agriculture within a certain time period and those who are continuing their operations (Lockeretz *et al*. 1987; Zollinger and Krannich 2002; Bragg and Dalton 2004). Overlooked is a third category,

those that have already exited farming. It is expected that these former apple growers will have a different outlook on the situation than those still in operation. Finally, besides former growers, this research will solicit the opinion of those in the ñknowledge community.ò These are not actual growers, but those who are connected with and have an understanding of the industry. They include processors, bankers, county extension agents, and agricultural researchers. The perceptions of the members of the knowledge community and farmers may differ from one another. This was the case of a failed tomato cooperative on Waldenôs Ridge, Tennessee where the knowledge community blamed the farmers for withholding some of their crop while the farmers felt there was an excessive culling of the tomatoes marketed (Harstin and Leuthold 1995).

Concern over the plight of farms usually centers on agricultural production, farm viability, loss of regional identity, and maintaining the amenity value of farmscapes (Bryant 1984; Blank 1998; Bryant and Johnston 1992). Some are worried that conversion of prime farmland will inhibit the nationôs ability to feed itself. Outside of a few counties that produce most of our winter vegetables, this is a long-view concern at best. Our nation struggles with the effects of overproduction, not underproduction (Hart 1991; Bryant and Johnston 1992; Heimlich and Anderson 2001). Maintaining the agricultural viability of a region is not only important for the protection of the oft-idealized family farm and jobs in support industries, but prevailing agricultural activities also contribute to a regionôs sense of place. This is often reinforced by county fairs and festivals featuring local products. Losing the local agricultural base is a harbinger of change in the regionôs identity away from its rural heritage. Many long-time residents

and newcomers lament this loss and value an areaôs open space and the scenic orderliness of a farmscape (Bryant 1984; Bryant and Johnston 1992; Olson 1999; Sacks 2010).

Threats to this amenity by development have become highly politicized in some forums. The concept of property rights has a long history of eliciting passion in this country. Farmers often wear two hats; they are advocates for farming but also are proponents of property rights. After all, as landowners, farmers stand to increase their portfolio earnings when farm property appreciates in value (Lapping 1980; Bryant and Johnston 1992; Sacks 2010). Proponents of development and those favoring limits on growth often butt heads with one another at the local and state level. Whatever the motive, steps to preserve the viability of agriculture and its related amenities through the purchase of development rights, subsidization schemes, and preferential tax assessments are often prohibitively expensive or ineffective (Hushak 1975; Lapping 1980; Libby and Stewart 1999). For example, the New England Dairy Compact provided a price floor to farmers under the assumption that price volatility was causing the rapid decline of dairy farms in Connecticut. While the Compact kept an extra 4 percent of dairy farms in business and moderately increased cow numbers, the average $10,000 subsidy per dairy farm was an extremely expensive method to save a few farms. Though pricing was important, the real driving forces underlying farm exits in Connecticut were development pressures and the availability of off-farm employment (Foltz 2004). Before prescriptive policy measures can be considered, it is vitally important that the underlying factors that affect a farmerôs decision to stay in, adapt, or get out of agriculture are understood.

Purpose

The purposes of this dissertation are: (1) to determine the factors behind the 25 year decline in apple acreage in the Shenandoah-Cumberland Valley Fruit District; (2) to determine why some areas of the Fruit District have declined at a faster rate than others; and (3) to learn which management practices remaining growers have adopted to keep their operations viable. Of particular interest is the impact of encroaching urban development on these decisions because the impermanence syndrome suggests that commodities requiring long-term investments (e.g. apple orchards) should be adversely affected by the shortened planning horizons created by the anticipated but uncertain timing of future conversion of agricultural land to urban uses (Sinclair 1967). The primary means of eliciting opinions that concern the factors contributing to the decision to continue or exit apple production was through a mail survey sent to the apple growers of the Shenandoah-Cumberland Valley Fruit District.

Communities are often faced with the challenge of trying to balance growth while maintaining a sense of their regional identity. Making normative assessments on whether or not it is appropriate for government or private interests to enhance the economic viability or ñpreserveò a highly visible landscape like orchards is beyond the scope of this dissertation. The findings of this study will, it is hoped, provide valuable information to county planners and policy makers faced with agricultural land conversion on the rural-urban fringe. Recognizing that land-use decisions are not just affected by urban influences, this study will use Bryantôs systems approach that considers the totality of factors at the macro, meso (regional), and micro (farm-level) scales (Bryant 1984; Bryant

and Johnston 1992). Knowing the causes of why some growers are leaving apple production and why and how others remain in business is important. Otherwise, policies designed to treat one symptom may fall short of their intentions because factors at another scale were not considered.

Organization of the Dissertation

The dissertation is divided into eight chapters. Chapter One provides an introduction to the topic, a rationale for the study, and outlines the purpose of the dissertation. Chapter Two is a review of the pertinent literature concerning the plight of agriculture in the rural-urban fringe, the structural changes occurring in U.S. agriculture, and the farm-level factors that influence a farmerôs decision to exit agriculture. Chapter Three introduces the Shenandoah-Cumberland Valley Fruit District and describes the status of the apple industry within the four sub-regions of the Fruit District. The dissertationôs methodological approach is explained in Chapter Four. This chapter explains the design and implementation of the mail survey, the conduct of follow-up interviews, and my own active and passive role as an observer witnessing the changes occurring in the Fruit Districtôs apple industry. The three chapters that follow Chapter Four reveal the results of the mail survey and interviews. Chapter Five discusses apple industry issues at the macro-scale. The chapter examines how the Shenandoah-Cumberland Valley Fruit District is responding to major trends in the U.S. apple industry, the impact of foreign trade on the processing industry, and the Fruit Districtôs market position *vis-à-vis* competing apple-growing regions. Regional issues, including the impact of growth and development on the Fruit Districtôs apple industry, are discussed in

Chapter Six. Chapter Seven looks at decision-making at the farm-level. Included in this chapter are discussions about the diversification of market outlets, farm reinvestment decisions, and farm succession. The final chapter, Chapter Eight, readdresses the purpose of the dissertation in the context of the data provided in the previous chapters. Chapter Eight concludes with a section about the Fruit Districtôs future outlook.

CHAPTER 2: LITERATURE REVIEW

Bryantôs systems approach to explaining agricultural land-use decisions in the rural-urban fringe requires one to consider multiple factors at different geographical scales (Bryant 1984; Bryant and Johnston 1992). Because many have written about an issue or two at a particular scale, the relevant theoretical discourse when each of the three scales is considered individually is quite extensive. This chapter begins at the regional-scale with the changes that are occurring in the urban morphology (form) and the impact these changes are having on agriculture in the rural-urban fringe. The discussion focuses on strategies used by farmers facing increased development and rising land prices. Certain land-use models are also reviewed. Next, at the macro-scale, I provide an overview of the major trends and global forces affecting agriculture today. At the farm-level and individual scale, decision-making in the agricultural context is discussed. The chapter concludes with a review of the factors contributing to farmers exiting agriculture. The focus in this chapter is on agriculture in general and is not specific to the apple industry. How these broad issues at the various scales play out in the apple industry will be described in detail in later chapters.

Models of Urban Growth

Scholars have long been interested in the relationship between agriculture and the city or market center. Based on observations of his own estate, the German economist and landowner, Johann Heinrich von Thünen, postulated that in a closed system with only one market center and no environmental variation, the agricultural commodities with

the highest profit margins will outbid competing commodities with lower profit margins for space nearest the town market. A series of concentric rings would arise on this economic landscape based on land rent, transportation costs, and perishability, with the highest value commodities (vegetables and fruits) located closest to the market center (Sinclair 1967; Wheeler *et al.* 1998). Even though von Thünenôs observations were formulated in the first half of the 19th century, his analysis remains relevant today, albeit at a broader geographic scale. Von Thünenôs notion of land rent gradients often form the foundation for modern scholarsô reinterpretation of agricultural land-use patterns made by changes in transportation and the structural form of the city.

At the turn of the 20th century, cities were focused on a monocentric central business district (CBD) (Muller 1981). Most roads and streetcar lines were designed to funnel people in and out of the CBD. While some suburbs existed along rail lines, there was a sharp distinction between the city and the surrounding countryside. In the post-World War II era, pent-up housing demand, rising incomes, the automobile, and favorable housing policies encouraged a democratization of the suburbs. Despite the influx of people and automobile-dominated infrastructure, these suburbs were primarily bedroom communities that served the single-core central city (Hartshorn 1992; Lewis 1995).

By the 1970s, retail, office space, and manufacturing followed residential patterns and began concentrating in suburban nodes. This spatial reorganization gave rise to the polycentric city. In the urban realms model, Peter Muller (1981) noted the emergence of ñminicitiesò or suburban downtowns that served the same function of a traditional CBD

but were largely independent of the central city CBD. In 1991, Joel Garreau (1991) coined the term ñedge cityò and gave further definition to these suburban centers. Edge cities are not replacing downtown, but are growth poles that act as intervening employment opportunities (Greene 1997). Garreauôs work has inspired other interpretations such as Robert Langôs (2003) ñedgeless citiesò which holds that most leasable office space is not concentrated in nodes but is instead dispersed throughout the metropolitan region. Employment centers in the edgeless city include high-tech corridors where office parks, research and design laboratories, and multi-use flex spaces typically spread out in a linear pattern along interstate highways far from the CBD (Knox 1991).

Whether it is an edge city or edgeless city, the shift of jobs from the central city CBD to the outer suburbs has been dramatic. Today, only 21 percent of private sector employees in the largest 98 metropolitan areas work within three miles of the CBD. In contrast, over 45 percent of the private sector employees in these same metropolitan areas work from 10ï 35 miles from the CBD, a gap that has grown over the past decade despite the residential revival occurring in many downtowns (Kneebone 2009). The effect of this diffusion of jobs has been the spatial enlargement of the metropolitan commuter shed (Wolpert and Danielson 1991; Lewis 1995; Greene 1997; Heimlich and Anderson 2001; Perrins and Nilsen 2006). Depending on the perspective of the observer, different nomenclature is used to refer to these commuting sheds. The term ñrural-urban fringeò is used if the emphasis is on agricultural and rural land-use change, while ñemerging suburbsò or ñexurbiaò is used by those focusing on the changes occurring in the urban form and function (Audirac 1999).

The rural-urban fringe is defined for this study as a zone of transition emanating out from a metropolitan center that mixes newer urban-type land uses with the existing rural land-use patterns. This zone includes the actual interface and a much wider region of gradually lowering urban influence, especially in terms of land values. Growth in this rural-urban fringe region is uneven, chaotic, and prone to the fluctuations of the economic cycle (Sinclair 1967; Hart 1991). Leapfrogging growth has created a patchwork of low-density residential land, active farmland, and open space in the rural-urban fringe. While the open space will presumably be eventually filled-in with more housing, strip malls, and other suburban-style accoutrements, this type of space-consuming, automobile-dependent development has earned itself a pejorative and often politicized term ï sprawl (Clawson 1962; Hart 1991; Heimlich and Anderson 2001). Local growth machines, vested interests that benefit from growth in an area (e.g. locally based business owners, developers, land owners, real estate agents, banks and the local newspaper), encourage this style of growth (Molotch 1976). This low-slung growth pattern is typical for most metropolitan areas even if their overall population growth has been limited (Lewis 1995; Heimlich and Anderson 2001).

From the urban form perspective, exurbia is the semi-rural home of workers willing to commute 50 miles or more to the central city or suburbs for employment (Muller 1981). Berube *et al*. (2006) define exurbs based on economic connections to the metropolis and, compared to the rest of the metropolitan area, lower housing densities but higher growth rates. Frequently, this growth takes the form of new low-density, rural subdivisions whose residents often have an urban outlook on life and no real ties to the

land. Peirce Lewis (1995, 46) calls this new urban form the ñgalactic city,ò and describes the rural-urban fringe/exurbia as a place ñwhere all the traditional urban elements float in space like stars and planets in a galaxy, held together by mutual gravitational attraction but with large empty spaces in between.ò This is an expansive area that has an implied connectivity among the city, suburbs, and exurbs. Its main streets are the highways and interstates that give access to those living in the exurbs to the commercial and industrial clusters that arise at highway junctions.

Several studies have tried to explain why people move to exurban areas. Of course, some people move because their job relocates. Many other exurbanites make a personal decision to move to a lower density area and commute. These exurbanites are typically two-wage earner families, though one partner may hold a job in the local area (Davis and Nelson 1994). Although some commuting of blue collar workers occurs, the majority of exurban commuters have managerial or professional jobs. This trend was described by Hartshorn and Muller (1992) who noticed a commuting flow of laborers from West Virginiaôs Eastern Panhandle to the developing Washington Dulles airport area. Exurbanites place less importance on convenience and, in the case of Sonoma County, California, housing expense (Crump 2003). In other areas, housing expense is a factor because exurban land prices are typically lower. For their money, these home buyers get more house and a larger lot at the expense of a longer commute and fewer government services. In essence, these middle-income families are driving further to qualify for a more affordable home (Kosnett 1992; Whoriskey 2004b; Berube *et al.* 2006). Finally, dissatisfaction with the suburbs is another reason why an outmigration

from the inner and outer suburbs to the exurbs has occurred (Berube *et al.* 2006). People want to live in a rural area with open spaces but with access to urban amenities when needed (Davis and Nelson 1994; Crump 2003).

Agriculture in the Rural-Urban Fringe

Land Markets

Fueled by the demand for land for new residences and other non-agricultural uses, one of the main characteristics of the rural-urban fringe is the pricing of land above its agricultural valuation. In addition to its farmland value, land prices in the rural-urban fringe are a function of the actual costs of conversion, the value given to its accessibility, and most importantly, the present value of the expected future increases in rent obtained from the parcel after it is converted to urban-style uses. This last factor is often responsible for the disparities in land prices between two citiesô housing markets as it may account for over one-half of the price of land in a rapidly growing metropolitan region (Capozza and Helsley 1989). Favorable characteristics such as nearness to a city or a highway, availability of public services, parcel size, and land policies that encourage development also increase land values. The productivity of the soil is secondary to these attributes (Hushak 1975; Chicoine 1981). As long as the *potential* for future conversion exists, land values will increase (Clawson 1962; Clounts 1970; Sinclair 1967; Capozza and Helsley 1989; Bryant and Johnston 1992; Libby and Stewart 1999). This potential for greater profits in converting farmland to urban uses has led to a land market driven by speculation. Land in the rural-urban fringe is viewed as a safe investment that is expected to increase in value over time. Land is no longer viewed as a means of

production but rather as a commodity for investors to reap future capital gains (Bunce 1985; Libby and Stewart 1999).

The anticipation of eventual land conversion increases land values across an area greater than what will reasonably be developed in the foreseeable future (Bryant and Johnston 1992). Even if growth cools during an economic downtown and the outward expansion of the urban core slows, the expectation of future conversion remains and continues to be reflected in land prices. Much of this land that has seen its valuation shift from its agricultural potential to its development potential will actually remain in agriculture for extended periods. In their desire to make some return on the land prior to conversion, land owners often willingly rent the land to farmers for less than the true market value (Gottmann 1961; Clawson 1962; Sinclair 1967; Bunce 1985; Hart 1991; Bryant and Johnston 1992; Pillsbury and Florin 1996). So, while the entry purchase price for non-inherited agricultural land can be prohibitively expensive for first-time farmers and for farmers seeking to expand their existing acreage through the purchase of land, the renting of farmland in the rural-urban fringe is often affordable (Gottmann 1961; Lockeretz *et al.* 1987; Pillsbury and Florin 1996; Libby and Stewart 1999; Daniels 2000; Ferry and Brock 2003). Differential tax rates that hold land taxes low as long as the land is in agricultural production also promote cheaper rents. Land owners are willing to sacrifice short-term income via low rental prices for larger capital gains in the future. The down side for a farmer who is renting land is the fact that only the land owners have ultimate control over the future use of their land. This places the long-term viability of a

farmer who relies on rented land in a potentially vulnerable position (Bunce 1985; Bryant and Johnston 1992).

This reliance on other peopleôs property combined with an anticipation of land conversion can potentially lead to an impermanence syndrome (Clawson 1962; Sinclair 1967; Krueger 1978; Lockeretz *et al.* 1987; Bryant and Johnston 1992). Given the rising land values and the air of uncertainty that surrounds farm viability in an area, it is theorized that a farmer would be less inclined to reinvest in major capital improvements in which he or she may not be able to recover the costs of his or her investment (Berry 1979). Short-term planning horizons may promote less intensive use or even idling of the land. This attitude among farmers essentially becomes a self-fulfilling prophecy as the lack of reinvestment in improved technology and capital projects reduces the farmôs competiveness, profitability, and ability to stay in business. As more land is taken out of production due to conversion, the agricultural support industries may fall below the critical threshold of business needed to stay viable (Clawson 1962; Prunty and Aiken 1972; Krueger 1978; Lockeretz *et al.* 1987; Olson 1999; Edwards 2004). The closing of local suppliers and processors could raise costs through the lessening of competition and increase in transportation expenses (Lynch and Carpenter 2003). Loss of the surrounding agricultural infrastructure, difficulties in obtaining land, declining political power, and potential conflicts with new neighbors (increased traffic, vandalism, pesticide restrictions) challenge the remaining farmers (Berry 1978; Krueger 1978; Lapping 1980; Bryant 1984; Bryant and Johnston 1992; Sokolow 2003).

Selling Out

Rising land values and increasing urbanization are a mixed blessing for farmers. One positive benefit is that higher land values enable farmers to sell their land for a price that could never be attained if the land had remained in agriculture. Because many of their assets are capitalized in the farm, farmers typically ñlive poor and die richò (Blank 1998). Selling out allows the farmer to settle debts, earn cash, or reinvest in other opportunities. At some point, the opportunity costs become too much to pass up (Coughlin, Keene, & Associates 1997). One Frederick County, Virginia apple grower explained ñWe were breaking even. Thatôs losing money when you put out $200,000 up-front before you see a penny. You lose all the interest on your money and the value of your land is sitting there unusedò (Edwards 2004). Like the former Virginia grower, some farmers will leave agriculture altogether, either to settle into retirement or to accept off-farm employment in the urbanizing area. Other farmers will cash out and relocate their operation on cheaper land. For example, dairy farmers who had once been concentrated enough to incorporate the towns Dairy Valley, Dairy City, and Dairyland on the Los Angeles/Orange County line began setting up large dry lot dairies in San Bernardino Countyôs Chino Valley 35 miles away (Nelson 1959). Now the movement is to the San Joaquin Valley (Hart and Mayda 1998; Hart 2003). Other crops have followed a similar trajectory from the growing California metropolitan areas into the Valley. These include citrus from Los Angeles and Ventura counties, apricots from the Santa Clara or ñSiliconò Valley, and garlic from the Gilroy/Hollister area (Gregor 1957; Parsons 1986). Elsewhere, farmers in the Ile-de-France were gradually relinquishing

their orchards in their initial core area while setting up new orchards 15 kilometers away, and orchards that were being displaced in Canadaôs Niagara Fruit Belt were being intensified in less-favored, rural areas nearby (Krueger 1978; Bryant 1984).

Agricultural Adaptation – Intensification

Rather than selling their land, farmers on the rural-urban fringe may attempt to increase their returns per acre by investing in more labor or capital. This intensification of production also implies making a change to their farm model (Clark *et al*. 2007). For example, an orchardist may switch to dwarf rootstock that requires a trellis system for support. A high-density orchard of this type requires a higher initial investment but offers potentially earlier and higher returns. Another option is to convert to higher-value crops as land rents rise. This is shown visually in Blankôs (1998) Farming Food Chain Model (Table 2.1). As land value rises, the farmer moves up the food chain to increase cash flow. The drawback to this strategy is that the activities that generate higher returns per acre also generally increase the risks involved while decreasing land flexibility. For example, once an orchard is planted, a farmer cannot shift to corn the next year because of anticipated good prices. Agricultural land can leave production at any stage in the food chain as not even the highest value crops can compete with urban uses (Blank 1998).

Table 2.1 Farming Food Chain

Stage	Crop Type	Investment	Asset Fixity	Example
1st	Low value annual	Low	Very flexible	Wheat, corn
2nd	Low value perennial	Moderate	Flexible	Alfalfa
3rd	High-value annual	High	Inflexible	Lettuce, strawberries
4th	High-value perennial	Very High	Highly fixed	Orchards, vineyards

Source: Blank 1998

Evidence of this trend can be seen in John Fraser Hartôs (1991) ñperimetropolitan bow waveò model of agricultural change in the New York City region. Hart likens agricultural change to the wave created by the prow of a ship as it moves through water. As suburban land spreads outward from the core over time, emphasis of production shifts in the band of land beyond the rural-urban interface. An increase then occurs in the ratio of nursery crops and, to a lesser extent, vegetables by value compared to other agricultural products. This represents both farmers intensifying their use of land and the decline of other forms of agriculture in this area. The increasing agricultural value of land in this band of change is solely a result of location and not any inherent value of the quality of soil (Hart 1991). Urbanizing areas tend to increase the demand for locally-grown vegetables. In fact, 61 percent of all vegetable acreage is located in metropolitan areas. A further reflection of the bow-wave principle is that since 1959, more than 40 counties have moved into the rankings of the top 100 vegetable producing counties (Heimlich and Anderson 2001). Akin to von Thünenôs firewood and timber zone,

nursery crops and sod farms produce bulky, hard-to-transport, and rather perishable products. They benefit from being close to their residential customer base that needs landscaping products (Gottmann 1961; Hart 1991; Wolpert and Danielson 1991; Bryant and Johnston 1992). Thus, there tends to be a positive complementary relationship between urbanization and the growth in nursery and vegetable operations (Lawrence 1988; Bryant 1984).

While vegetable and nursery crops have maintained and even flourished in the rural-urban fringe, dairy operations and, to a lesser extent, orchards have seen the most slippage (Krueger 1978; Berry 1979; Lawrence 1988; Hart 1991; Sokolow 2003; Foltz 2004). By value, these would be at or near the top of the farming food value chain. Their main drawback in an urbanizing area is their need for expensive, long-term investments that have a high degree of spatial fixity. A dairy farm requires milking parlors, a barn, milk storage tanks, silos for food storage, fencing, drainage upgrades, waste disposal, tractors, and the livestock itself. Many of these are expensive, immobile assets needing a long period to amortize (Berry 1979). They also have little value outside of dairy farming in comparison to their costs. A dairy farmer cannot just switch to broilers or vegetables without wasting the money invested in dairy technologies, and developers are only interested in land, not new barns (Buse and Bromley 1975; Berry 1978). Intensification works best when paybacks of capital inputs are short-term, capital improvements are transferable, or it is more labor- than capital-intensive such as vegetable production (Bryant and Johnston 1992). A farmer may continue making short-term investments, but not the long-term ones that affect the operationôs ultimate viability.

For example, with orchards facing development pressure, it is in the growersô interest to operate as long as possible to recover the investment costs but to not replant (Clawson 1962). On the other hand, Bryant and Johnston (1992) suggested that the profit margin upon conversion is so great that farmers may continue to make large investments due to historical inertia (a desire to continue to produce a familiar commodity) and the temporal uncertainties of the development process. The farmer will still make a profit when he or she sells out even if he or she does not earn back some of the initial costs of investment. Still, studies have shown that the dairy industry has declined precipitously in the rural-urban fringe of New York and Chicago (Berry 1979; Hart 1991). Even programs designed to prop up milk prices such as the New England Dairy Compact have not abated the decline of dairy farms in Connecticutôs rural-urban fringe (Foltz 2004).

Bow-wave patterns of agricultural change have been noticed in other studies as well. When Lawrence (1988) looked at seven U.S. metropolitan areas over a 30-year period, he found that horticultural specialties, including nursery products, dominated the sales by value and have even increased in acreage. The most rapid decline occurred in the number of dairy cows. Land in field crops, fruit, and vegetables had overall acreage declines though vegetable acreage was increasing in counties on the outer edges of the metropolitan areas. A similar situation has occurred in southern California. Between 1950 and 2001, the top commodities by value in Los Angeles and Orange counties shifted from citrus and dairy to nursery products, vegetables, and strawberries (Sokolow 2003).

Agricultural Adaptation – De-intensification

Rather than intensifying and moving up the farming food value chain, a farmer may choose to de-intensify his or her operation. Due to changes in transportation and refrigeration, Sinclair (1967) felt that the anticipation of urban encroachment was a more important variable to consider in a modern-day interpretation of von Thünenôs concentric rings. Sinclair theorized that the areas closest to the urban center would be the areas of least intensity. As the urban shadow lessened, farmers were more confident that their investments would pay off in the long-run. With distance from the urban core, an intensification of agriculture occurs until the urban influence wanes and it takes on the characteristics of the regional agricultural regime (Sinclair 1967).

One example of this pattern is the continuance of cash grains and other field crops (hay, alfalfa, silage) in the urban pressure zones. Though the number of farm enterprises has declined, lower rates for rental land have allowed the remaining farmers to expand their operations. This promotes economies of scale and this efficiency enables these farmers to remain competitive in their costs and returns with farms in non-metropolitan areas (Bunce 1985). Despite relatively low returns per acre, the advantage that cash grain farming on the urban-rural fringe has over dairying is the flexibility of its assets. Not only can the farmer switch crops annually according to price indicators, but harvesting machinery such as combines, though expensive and requiring a long-term investment, are also mobile (Berry 1979; Bryant and Johnston 1992). If the landowner sells, he or she can simply move their combine to another rented plot in the increasingly fragmented patchwork of farmland on the rural-urban fringe.

De-intensification of agriculture can also occur in the livestock realm. Because proximity to urban centers enables farmers and their family members to seek off-farm employment opportunities, time constraints can encourage the shift from dairy cows to beef cattle. Whereas dairy cows require a high degree of management skill and daily milking, beef cattle mostly forage in pastures and require little daily supervision. In cow-calf operations, a breeding herd is managed for the purpose of selling the calves. The small herd and acreage requirements as well as low variable and fixed costs make cow-calf operations popular among part-time farmers (Cash 2002). The horse industry also has a strong presence in the rural-urban fringe. The demand for boarding horses for recreational use has increased as new arrivals desire a taste of rural living. Both farmers and people without traditional farming backgrounds have taken advantage of this opportunity (Bryant and Johnston 1992; Bennett 2004).

Hobby Farms

Horse boarding and small beef cattle operations are popular enterprises for hobby farmers. Hobby farms fall into two categories: lifestyle and retirement farms. Lifestyle farms are operated by part-time farmers whose primary incomes are earned through off-farm employment (Hoppe and Banker 2010). Many of these operators do not self-identify as farmers but rather with their other occupations (Smithers and Johnson 2004). Retirement farms are run mostly by former full-time farmers, but there are also new entrants to farming. For retirement farmers, the bulk of their incomes consist of Social Security payments, pensions, or other investments. Commodities produced by hobby farms tend to be less labor-intensive to accommodate the part-time nature of the

operation. They also require less capital and less need to keep up with changing technologies. Pasturing beef cattle, horses, sheep, goats, and cutting hay are the most common hobby farm activities while cash grains, vegetables, and fruit are less common (Hoppe and Banker 2010).

Hobby farms tend to be small operations as over 75 percent had less than $10,000 in annual sales. Many operate at a financial loss with only 55 percent of lifestyle farms reporting positive net income (Hoppe and Banker 2010). Hobby farms are farmed more for personal enjoyment, prestige, or for something to do during retirement, all consumptive activities rather than productive ones (Gottmann 1961; Bryant and Johnston 1992; Smithers and Johnson 2004). Despite their lack of sales volume, hobby farms with under $10,000 in sales account for 54 percent of all metropolitan area farms and are important for helping to maintain the amenity farmscapes that contribute to the attractiveness of an area (Gottmann 1961; Bryant and Johnston 1992; Heimlich and Anderson 2001).

Direct Marketing

In addition to changing crop mixes, another option for farmers in urbanizing regions is to change their system of exchange (Bryant and Johnston 1992). Traditional farms grow and harvest a commodity and then sell that commodity to a processor or wholesaler. The farmers remain a step or two removed from the ultimate end user. Typically, vegetable and fruit farmers earn 16 to 19 cents on the dollar with most of the end retail price going to the processor, middlemen, transportation costs, or the retailers themselves (Lucier *et al*. 2006). Farmers in the rural-urban fringe can take advantage of

their proximity to urban consumers by eliminating the middlemen and selling directly to the public. In removing the steps between them and the food-buying public, farmers aim to capture a higher percentage of the food dollar for themselves and increase their income per acre. Prices received by selling directly to consumers are typically higher than what farmers receive wholesale but lower than what consumers pay at grocery stores. In addition to competitive pricing, consumers are attracted by the fresh taste of just-picked items and the positive perception of the safety of local food (Gale 1997; Roth 1999).

With direct marketing, the urban consumer either has to travel to the farm or the farmer travels to the consumer in the form of a farmers market (Roth 1999). One way to attract more consumers to on-the-farm retail is to add entertainment options such as hayrides, corn mazes, and exotic animals (Pillsbury and Florin 1996; Oates 2007). Besides fresh produce, these new agritourist destinations are selling a form of rural romanticism, the ñfarm experience,ò to urbanites no longer connected to the land (Che *et al*. 2005b; Veeck *et al.* 2006). Direct marketing has also been responsible for diversifying the agricultural output of the farm in order to have a variety of products to sell at the farm stand or farmers market. By growing an assortment of fruits and vegetables, it extends the marketing season. Selling value-added products such as apple butter, cheese, or baked goods accomplishes the same goal, a way to increase revenues with a diversified product base (Roth 1999).

While direct marketing can offer farmers higher returns than selling to processors or wholesalers, challenges are involved. Opportunity costs include the time spent traveling to farmers markets, running a farm stand, or producing more management-

intensive crops such as fruits and vegetables. Other costs may include hiring additional labor, general overhead, and dealing with increased regulations (Roth 1999; Dunn *et al*. 2006; Martinez *et al*. 2010). The grower must also absorb costs such as cooling the produce and advertising that were previously passed down the supply chain. Additionally, a different skill set is required. Farmers are good at growing food, but with direct sales, marketing and store management acumen are also needed. For some farmers, dealing directly with the general public is outside their comfort zone (Burt *et al*. 2000). For others, particularly part-time lifestyle farmers, the personal interactions with customers and other vendors at farmersô markets are a highlight of the job (Gale 1997; Gomez *et al*. 2010). The social dimensions of direct marketing often trump the economic, especially among part-time, lifestyle farmers.

Farm Trajectories

The impermanence syndrome posits that agricultural land in the rural-urban fringe is on a gradual, but permanent downward spiral until its eventual conversion to other uses. While this conceptual framework may be intuitively appealing, farmers have adjusted to the challenges and opportunities presented in the rural-urban fringe in a variety of ways. According to Clark *et al* (2007), farms can be classified into five trajectories according to how they handle the changing nature of the rural-urban fringe. The five trajectories are: (1) growth; (2) intensification; (3) persistence; (4) de-intensification; and (5) decline. Intensification refers to farms that have increased the intensity of their labor, managerial, or capital inputs to earn a higher economic return per acre. This includes the shift from lower- to higher-value crops. Often the acreage

utilized remains the same or even decreases. Intensification differs from the growth trajectory where the farm may be enlarged but no restructuring is needed to increase the economic return per acre. Those in the persistence trajectory operate farms that have stayed the same over the years or to which only incremental changes have been made. Farmers that have deintensified their operations have intentionally shifted to a less labor- or capital-intensive model. The fifth trajectory, decline, is the inverse of the growth trajectory.

Although not specifically designed for the rural-urban fringe, Smithers and Johnsonôs (2004) family farm trajectory model is also relevant. Smithers and Johnson divide their categories into expanding, stable, and contracting farms, with two sub-categories contained within each of these three categories. Both farm-focused and assisted-growth farms seek to expand the size and scale of their operations. Farm-focused farms are operations where a self-sufficient farm is the primary source of income, while assisted-growth farms do not support themselves and require off-farm incomes. Persisting farms also require off-farm income, but their owners are either unable to expand or do not think it is worthwhile to expand. Hobby farms are also in the stable category. Most income is earned off-farm and their owners are farming more for enjoyment than for economic reasons. Contracting farms are either forced down or winding down their size or intensity of production. Some farmers who try to be self-sufficient solely on farm revenue run into problems and are forced to downsize their operation in order to work off the farm. Others voluntarily downsize as they get closer to retirement age.

The diversity of farm trajectories would seem to give pause to the inherent fatalism of the impermanence syndrome. In a study in the urban periphery of Paris, France, Bryant (1981) found that the majority of farmers closest to the rural-urban fringe felt there was a low probability of an agricultural future in that area. As urban pressures decreased, there was a higher variability of answers until farmers in the most rural areas expressed a high probability of agriculture remaining in that area in the foreseeable future. Bryant found that while the tendencies of farmers closest to urban areas were to de-intensify their farm operations or purchase farms elsewhere, enough farmers had intensified to question the validity of the impermanence syndrome hypothesis. Thus, the relationship between location, farmersô evaluation of change, and actual farm change was not statistically significant. Two other studies confirm the variance of farmer actions on the rural-urban fringe. More farmers in Clark *et al*.ôs (2007) study made changes to their operations that reflected growth and intensification rather than de-intensification or decline. The same was true of fruit or dairy farmers near Worcester, Massachusetts (Lockeretz *et al*. 1987). Farmers in both studies showed a greater proclivity towards persistence than any other trajectory. Their farms remained similar in size and production during the previous five years.

Marginal Land

Finally, development is not the cause of all land leaving agricultural production in the rural-urban fringe. Some land is considered agriculturally marginal (Bryant and Johnston 1992). People may have eked out a subsistence living on it in years past, but substandard land would have a negative cost-benefit ratio in todayôs agricultural

marketplace. Some former farmland is replanted in trees to take advantage of rising timber prices but many former fields are simply abandoned, allowing for the passive reversion to forest. Thousands of acres of marginal land have returned to woodland in Megalopolis and the Piedmont South (Gottmann 1961; Hart 1968, 2010; Aiken 1998; Lubowski *et al*. 2008).

Land-use Policies

As more housing developments are built and the populations of rural-urban fringe areas increase, the potential for conflicts between farmers and their new neighbors also increases. People who are not used to living in semi-rural areas may not realize what the everyday workings of a farm entail. Complaints may arise from concerns over pesticide spraying, slow-moving farm equipment tying up traffic, strong odors from spreading manure on fields, and loud early morning noises. From a farmerôs perspective, urban spillover effects may include petty theft of crops, vandalism, littering, and dealing with complaints from the neighbors (Berry 1978; Bryant 1984; Lockeretz *et al.* 1987; Bryant and Johnston 1992; Heimlich and Anderson 2001; Sokolow 2003). Most states have ñright-to-farmò laws that protect farmers against nuisance lawsuits that target normal farm activities (Adelaja and Schilling 1999; Beesley 1999; Daniels 2000; Sokolow 2003).

To guard against conflicts, manage growth, and balance interests in terms of protecting the agricultural sector and home values, state and local governments often intervene in the land market by using financial incentives or regulatory means (Adelaja and Schilling 1999; Jackson-Smith *et al*. 2008). Financial incentives include differential tax assessments and the purchase of development rights. Growing communities require

higher taxes to provide new schools, utilities, and other services to their new residents (Berry 1978). As land valuations rise due to increased development and land speculation, tax assessments also increase. To keep taxes affordable for farmers, preferential tax rates based on the landôs current agricultural usage are given to farmers in lieu of tax rates based on its development potential, the landôs true worth in the market (Lapping 1980; Furuseth and Pierce 1982; Beesley 1999; Heimlich and Anderson 2001). Because farm revenues often do not keep pace with land values in a bullish land market, the preferential tax rates are intended to help maintain the economic viability of an areaôs agricultural sector by not forcing farmers to sell their land due to unaffordable property taxes (Adelaja and Schilling 1999).

In another financial incentive-based program aimed at land preservation, government agencies use a mix of local and state funds to purchase the development rights (PDR) from farmers. Farmers receive the difference between the landôs agricultural use value and the value of the landôs development potential in exchange for forfeiting the future right to develop that land (Lapping 1980; Adelaja and Schilling 1999; Jackson-Smith *et al*. 2008; Daniels 2000; Sacks 2010). PDR programs have two drawbacks. First, PDR programs are very expensive. Funding is usually limited so the amount of land the programs are able to preserve is also limited (Adelaja and Schilling 1999; Sacks 2010). While the farmer does get a nice lump sum that he or she can reinvest into the farm, PDR programs are geared towards the preservation of land and the buying of development rights does not guarantee the long-term agricultural viability of the area (Lapping 1980; Heimlich and Anderson 2001). For example, if other farms and

agricultural infrastructure leave the area, the taxpayers could end up protecting and paying for abandoned, overgrown fields instead of prime farmland (Sacks 2010).

In addition to financial incentives, local governments have regulatory means to manage land-use change. Many places have a comprehensive plan that represents the vision for the future development of the county. The comprehensive plan identifies community goals and guides how and where housing, transportation infrastructure, and economic development should take place within the county. Comprehensive plans are not legally binding but set the foundation and justification for other policies that are legally binding (Beesley 1999; Jackson-Smith *et al*. 2008). Other regulatory measures include agricultural zoning, growth management boundaries, and impact fees. Areas zoned ñagriculturalò limit the amount and intensity of non-agricultural uses of the land by enacting restrictions such as minimum lot sizes. Because large lots tend to be more expensive and require more outdoor upkeep, houses on large lots have a smaller market of willing buyers and are less profitable for developers (Furuseth and Pierce 1982). The goal of growth management boundaries is to direct future development towards designated growth centers, especially through the provision of infrastructure and utility coverage (Adelaja and Schilling 1999; Daniels 2000). Impact fees are charged to developers to help cover the cost of services as new residents typically cost more in services than they generate in taxes (Whoriskey 2004a). Impact fees raise the cost of development, potentially slowing the rate of land conversion (Adelaja and Schilling 1999).

Whether or not land policies are enacted depends on the areaôs existing social infrastructure (*e.g*. local leadership, associations) and political climate (Daniels 2000; Jackson-Smith *et al*. 2008). The political culture in many areas in the rural-urban fringe tends to be pro-growth and very defensive of property rights. Making decisions to manage growth or promote agriculture depends on how willing the local government is to forgo opportunities for potentially more lucrative uses of the land (Bryant and Johnston 1992). Actors involved in these decisions include the general public, farmers, politicians, planners, and interest groups such as the local growth machine and conservation groups (Molotch 1976; Beesley 1999). Public support is important because farmersô political and economic clout lessens as their relative economic impact on the community declines, a typical scenario in the rural-urban fringe (Berry 1978). The public tends to be supportive of land preservation and programs that help farmers as long as the programs are cost effective (Adelaja and Schilling 1999; Daniels 2000; Sacks 2010).

Farmersô views on land policies are often mixed. Farmers support right-to-farm laws, preferential agricultural taxation, and voluntary programs such as the purchasing of development rights. Less favored are regulatory land policies such as zoning (Larson *et al*. 2001; Jackson-Smith *et al.* 2008). The resistance to limitations on property rights is partly due to ideological reasons but also because it can reduce the potential value of their land (Bryant and Johnston 1992). For example, owners of farmland will often resist large minimum lot sizes because more money can be made by selling off smaller lots (Chicoine 1981). Besides future sales price, lowered land values could also negatively affect the loan terms necessary for their daily operations. Plans for stricter managed growth usually

start after land speculation in the market and development pressures are a *fait accompli* and are more contentious when farmers expect higher values for their land (Heimlich and Anderson 2001). Farmers also exhibit a high degree of ambivalence about land policies. In surveys by Larson *et al*. (2001) and Jackson-Smith *et al*. (2008), close to 40 percent of the famers consistently reported that the listed land policies had no effect on their operations.

Agricultural Issues at the Macro-scale

Labor

To survive, farmers not only have to adjust to urban-induced pressures but also must account for structural factors that have an effect on all farmers, not just those in the rural-urban fringe. Macro-scale concerns include labor costs, supply and demand, competition, government policies, and technological change. Farmers who grow crops that require hand harvesting and other labor-intensive tasks often rely on migrant workers from outside their region. Migrant workers fill farm jobs that locals are not willing to do for the wages farmers can afford (or are willing) to pay (Blank 1998). Formal networks, such as the H-2A visa program, and informal word-of-mouth networks connect labor-source areas with labor-seeking areas (Mines 1997; Schrecongost 1999). Migrants, defined as someone who has traveled at least 75 miles to obtain a job over the past 12 months, account for 42 percent of all hired crop laborers (Carroll *et al.* 2005). Many other hired crop workers are former migrants who have permanently settled in an area. Some migrants travel to multiple locations, following the harvest from place-to-place, while other migrants just shuttle back and forth seasonally between their home base and

one location. The transnational nature of the migration stream is revealed by the fact that 78 percent of all hired crop workers were born outside the United States, mostly in Mexico (Carroll *et al*. 2005). Hispanics have long played a dominant role in the agricultural labor force in the western United States. Over the past two decades, Hispanics have also become the predominant ethnic group among hired crop laborers in the southern, midwestern, and eastern United States (Mines 1997; Winsberg 1997).

Because labor is one of the highest variable costs in agriculture, efforts are made to replace labor with technology. Technological advances first encourage and then force farmers to adapt in order to stay in business (Blank 1998). Technological improvements such as high-density plantings, mechanical harvesters, hybrid seed, and precision farming have also increased yields. For example, from 1994 to 2004, U.S. vegetable production increased by 12 percent while the harvested acreage decreased by 1 percent (Lucier *et al*. 2006). Production technologies have also become more commodity-specific and knowledge-intensive. The limited flexibility of specialized technology has deterred the substitution of crops, encouraging the trend towards the specialization of farm operations on a narrower range of products (Buse and Bromley 1975; Smithers and Johnson 2004). Many farmers focus on just one or two commodities. While specialization generally breeds efficiency, it is also a riskier strategy than a more diverse product portfolio due to weather and market uncertainties (Wolpert 1964).

Marketing Channels

Streamlining and consolidation have been occurring further up the marketing chain too. Firms, such as packers and processors, integrate horizontally to take advantage

of economies of scale. Larger firms can invest in more efficient, new technologies that may be prohibitively expensive for smaller firms (Dimitri 1999). As scales increase, the need for large quantities of a uniform product has given rise to contract farming. Farmers will sign a contract with a processor agreeing to produce a specific amount of a commodity for a guaranteed price. The processor may then provide the farmer with the necessary seed, feed, and technical advice to produce the commodity to the processorôs desired specifications. Broilers, hogs, sugar beets, and vegetables grown for processing such as tomatoes, green peas, and cucumbers are often produced under the contracting system (Pillsbury and Florin 1996; Dimitri 1999; Hart 2003; MacDonald *et al*. 2004; Lucier *et al*. 2006).

Traditional supermarkets have been facing increased competition for the consumerôs food dollar. The percentage of total food sales spent at restaurants and other foodservice places continues to rise from 46.1 percent in 1994 to 48.5 percent in 2005 (Martinez 2007). During that same period, the sale of food for home consumption (groceries) from non-traditional grocery retailers had risen from 17.1 percent to 31.6 percent. The largest gain came from the growth of grocery sales at supercenters such as Wal-Mart and Target and warehouse clubs such as Costco and Samôs Club. In fact, Wal-Mart is now the leading grocery retailer in the United States. Drug stores and dollar stores are other important non-traditional grocery outlets due to their numerous locations. The growth of these non-traditional grocery outlets has come at the expense of conventional supermarkets, whose market share of groceries has slipped to 57.7 percent (Tropp *et al*. 2008). The competitive environment has suppressed food prices at the retail

level and forced traditional supermarkets to look for ways to cut costs to maintain their margins (Martinez 2007).

The desire to cut costs has led to the consolidation of supermarket chains through mergers and acquisitions (Dimitri 1999; Martinez 2007). In 2009, the top 20 food retailers in the United States accounted for 64.9 percent of all grocery sales (Kaufman and Kumcu 2010). Large retailers prefer to deal with large producers who can guarantee a steady supply of a standardized product, creating market access difficulties for producers of smaller volumes (Pillsbury and Florin 1996; Hart 2003; Henry 2005; Lucier *et al*. 2006). With fewer access points to the market, producers rely on each retail chain for a higher percentage of their sales. This gives more bargaining power to the large retailer. In this buyer-driven commodity chain, the large retailer is in the position to make demands on their suppliers (McKenna *et al*. 1998; O'Rourke 1998; Gereffi *et al*. 2005; Belrose Inc. 2006b; 2010c; Martinez 2007). For example, due to the increasing environmental and food safety concerns of its customers, the British retailer Tesco informed New Zealand apple growers that their orchards must follow an integrated pest management program to reduce pesticide use. The packinghouses or export companies had to develop a system to trace the apples back to individual orchards to ensure that these standards were being met. Despite the expense of initiating the new pest management system, Tesco would not pay a price premium for apples grown under this new standard. It was simply a condition that had to be met if growers wanted to continue to do business with Tesco, the largest single buyer of New Zealand apples (McKenna *et al*. 1998; O'Rourke 1998; Granatstein 2000).

Government Involvement

The government maintains an important role in the agricultural economy. Agricultural policies have been designed to provide food security at stabilized prices for both the producer and consumer. Subsidization through direct payments, countercyclical payments, irrigation projects, federal disaster assistance, federal crop insurance, low grazing fees on federal land, and even food programs such as free and reduced-priced school lunch programs promote these goals (Pillsbury and Florin 1996; Lucier *et al*. 2006). Another policy goal is to reduce the negative effects of farming on the environment. The Conservation Reserve Program pays farmers to remove environmentally sensitive land from long-term crop production. Besides land retirement programs, increased emphasis on using conservation strategies is taking place on land still in production. Programs such as the Environmental Quality Incentives Program provide funds to assist farmers in implementing ways to reduce nutrient and pesticide runoff (Claasen 2009).

The federal government is involved in agriculture in other ways, too. It promotes research through grants to universities and maintains a system of USDA field research laboratories scattered throughout the country. The Agricultural Marketing Service (AMS) helps set grading standards for meat, fruit, dairy, and eggs so that buyers and sellers have an established system for determining the size and quality of the product. The AMS is also responsible for setting the standards for certifying organic farms as well as enforcing country of origin labeling for meats, nuts, and produce (USDA AMS 2010a). A substantial regulatory system has developed to monitor food safety, pesticide use, and

worker safety (Lucier *et al*. 2006). While these programs and regulations are intended to promote the greater good, some of the ñbureaucratic red tapeò paperwork can be time-consuming, adding to the frustration levels of the farmer (Bryant and Johnston 1992).

Sometimes the agricultural sector may not be the primary driver of policy, but decisions made in other arenas of government end up having a major impact on those in agriculture. One example is the flood control projects of the Army Corps of Engineers, an agency of the Department of Defense. A by-product of its dam and levee system is the protection of thousands of acres of prime farmland from periodic flooding (Carter and Cody 2005). In another example, federal immigration policy has been a hot button issue for years. Attempts to balance employersô demand for affordable labor with solutions that are politically feasible have been elusive of late. According to the 2001ï 2002 National Agricultural Workers Survey, undocumented workers accounted for 53 percent of all hired crop laborers (Carroll *et al*. 2005). An alternative option for legal agricultural labor is the H-2A visa, a temporary guest worker program for non-immigrants (Evans 2009). Finally, and perhaps most importantly, the macroeconomic policy decisions from the Federal Reserve influences the cost of borrowing money through the manipulation of interest rates (Bryant and Johnston 1992).

The government also helps farmers in the trade forum with foreign policy decisions. Various government aid programs buy food grown by U.S. farmers to donate or sell to foreign governments and agencies. These programs exist to promote diplomacy, economic development, child nutrition, hunger relief, and emergency disaster assistance (USDA ERS 2009a). Another benefit is that, similar to the AMS with

domestic feeding programs, foreign food aid programs help dispose of the annual agricultural surpluses produced by American farms (Pillsbury and Florin 1996; Lucier *et al.* 2006). Once again, the Federal Reserve plays a role in trade success. The strength of the dollar impacts the desirability of U.S. exports in the global market with a weak dollar encouraging exports (Huang and Gale 2006).

Tariffs and non-tariff barriers (mostly concerning food safety) impact the flow of agricultural products into and out of the country. The worldwide trend has been towards more liberalized trade. The European Union, Japan, and the United States have been notorious for protecting farmers through subsidization (OôRourke 2001; Lucier *et al*. 2006). Recent World Trade Organization negotiations have stalled over agricultural issues. Nonetheless, progress is being made. For example, the World Trade Organization ruled in 2005 that several Japanese phytosanitary restrictions were not scientifically-based and eliminated what had been an effective non-tariff barrier for Washington State apples (Calvin and Krissoff 2005). Trade agreements such as NAFTA (North American Free Trade Agreement), CAFTA, the Andean Trade Preference Act, and a bilateral one with Chile increase the volume of trade by reducing tariffs (Che *et al.* 2005a; Che 2006; Lucier *et al*. 2006). These agreements create new market opportunities for U.S. farmers. The government also assists through the Market Access Program. This program provides matching funds to commodity marketing boards to promote U.S. agricultural products overseas (Lucier *et al*. 2006; USDA ERS 2009a).

The liberalization of trade has also led to more competition between American and foreign producers in the domestic market. Historically, food exports to the United

States were primarily tropical fruits and off-season fruits and vegetables grown in the Southern Hemisphere or Mexico. Lower trade barriers combined with cheap labor has increased direct competition in produce where there is a seasonal overlap as well as in items such as garlic and apple juice concentrate from China (Huang and Gale 2006; Lucier *et al*. 2006). These factors, as well as the desire for a diverse array of product choices, have contributed to the increase in the domestic consumption of fresh fruit imports from 35 percent in 1990 to almost 50 percent in the late 2000s (Perez 2011).

Foreign producers are not the only source of competition. Domestic, interregional competition is an important macro-scale consideration. Some areas of the country have comparative advantages in climate, scale of production, or product quality. An areaôs or stateôs farmers may be willing to tax themselves to promote marketing strategies (van Voorthuizen 2001; Oates 2007; Wilmot *et al*. 2008;). Responsiveness to technological change can also determine the long-term viability of an agricultural district. Areas that are able to more fully integrate these technological changes earlier than their counterpart regions are more likely to prosper (Prunty and Aiken 1972; Aiken 1998).

Supply and Demand

Market supply is a final macro-scale concern. Supply can be affected by prices and events. Higher expected prices create the incentive to increase production either through expansion of existing enterprises or entry of new firms. The commodityôs placement on the Farming Food Chain determines when this increase will be experienced. For example, increased corn acreage will be reflected in the current yearôs pricing while orchard crop prices will not be impacted until the trees mature several years

after the planting (Buse and Bromley 1975; Blank 1998). Overproduction causes prices to decrease. Overproduction is a common occurrence due to the inelasticity of the agricultural supply curve. Land and specialized machinery are fixed costs that often cannot be transferred to other non-agricultural uses. As long as the farmer can cover variable costs and some of the fixed costs, farmers will tend to continue production. The government seeks to mitigate losses to farmers of program crops through countercyclical payments, the buying of surpluses, and the use of acreage allotments to regulate supply (Pillsbury and Florin 1996; Lucier *et al*. 2006). Supply is also affected by external events of both natural and human origin. For farmers, weather is typically uncertain. Adverse weather such as frost events in the Florida citrus regions or high winds can cripple a regionôs production, decreasing overall supply and increasing prices. In other cases, the disaster is created by humans. For example, the Asian financial crisis of 1997 decreased the demand for American apples in the important Asian export market. Washington state-grown apples that were originally intended for export found their way to domestic markets, thus depressing prices (OôRourke 2001; Edwards 2004; Pollack and Perez 2005).

To counteract strong supply situations, industry marketing commissions can work with retailers to induce demand through the use of targeted promotions and advertisements. Short-term strategies such as weekly newspaper ad-buys and in-store displays work best together with longer-term ad campaigns designed to build the identity of the commodity (van Voorthuizen 2001; Wilmot *et al*. 2008). The California Raisin Advisory Boardôs singing Claymation raisins and the Milk Processor Education

Programôs ñGot Milk?ò campaign featuring celebrities sporting milk mustaches are two well-known examples.

Like the supply curve, demand can shift rather abruptly at times. Fads may spur dramatic increases in the demand for previously obscure products such as pomegranate juice. A menu change at a national restaurant can have a similar effect, especially if its competitors make a copycat product (Pillsbury and Florin 1996; Martinez 2007). Demand can experience a market shock in the other direction too. For example, the news program *60 Minutes*ô 1989 exposé on the potential harmful effects of Alar, a chemical widely used in the apple industry, created a steep, but temporary decline in demand for fresh apples and apple products (Shabecoff 1990; O'Rourke 1994; Lehnert 2012c).

Overall, demand has been increasing for food products that are visually appealing, healthy, and convenient to use. Since the early 1990s, consumption of fresh vegetables and non-citrus fruits has increased while canned vegetable and fruit consumption has decreased (Lucier *et al.* 2006; Buzby *et al*. 2010). At the same time, the marketing of organic and natural foods has seen marked growth. Spurred on in part by consumers concerned about the environment and their own health, these products usually command a price premium at the retail level (Gale 1997).

Devolution of Agricultural Districts

Sometimes, once vibrant agricultural districts go into serious decline or disappear altogether. Reasons for decline are varied and can range from competitive disadvantage to environmental degradation. Once one of the most prolific producers of cotton, cotton farming in the southern Piedmont is now but a faint shadow of its former self. Much of

this decline has been attributed to lagging leadership and interest among the land owners (Raper and Reid 1941; Aiken 1998). Drawn to other economic pursuits, the close management necessary to run an efficient plantation system was lacking. Cotton growers were unprepared or unwilling to face the dual threats of boll weevil infestation and soil degradation. By 1930, much of the Piedmont was out of production. For those that continued to grow cotton, the death knell came in the inadequate transition to mechanization. Compared to other cotton-producing regions like the Yazoo Delta, the north Mississippi Loess plains, and the irrigated fields of California, Piedmont farmers were slow to adopt new technology. This was compounded by most cotton ginners not upgrading their machinery to handle machine-picked cotton. Growers shifted to cow-calf operations, pine tree farms, broilers, off-farm employment, or put their land in the Soil Bank. When the growers left, the remaining ginners lost the critical mass to stay in operation (Prunty and Aiken 1972; Aiken 1998).

In another study, Bell and Gripshover (2002) evaluated the devolution of the highly specialized yellow bottleneck onion-growing complex near Davenport, Iowa. Farmers mostly attributed the decline to the yellow dwarf blight and labor shortages. Like the boll weevil, Bell and Gripshover (2002) feel that these reasons were more a symptom of an underlying dysfunction than the main causal factors. Lack of cooperation among the growers themselves, urban encroachment increasing land values, and the desire to work off-farm, especially with the younger generation, all contributed to the devolutionary tide. Labor had shifted from locals to a primarily migrant force. Wage rates and other overhead labor costs rose to a price higher than the fiscally conservative

farmers were willing to pay. These reasons all had an equal if not greater impact on the region than the yellow dwarf blight. The implication is that the farmerôs own perceptions may not tell the complete story behind the decline of a specialized growing complex.

Decision-making in Agriculture

It is the aggregation of many individual decisions that determine the landscape and long-term viability of an agricultural region (Harvey 1966; Bryant and Johnston 1992; Libby and Stewart 1999; Heimlich and Anderson 2001). These landscapes evolve over time through trial and error (Foust and deSouza 1978). While farmers have a certain freedom for decision-making, they must work within the environmental and human-constructed constraints of the system (McCarty and Lindberg 1966). For example, a farmer can modify the existing soil quality with fertilizers but cannot grow oranges in Vermont (Bryant 1984). Likewise, it may be physically possible to grow a product in large quantities at a certain location, but if processing capabilities do not exist or consumer demand is low, then the farmer is just wasting his or her time.

Decision-making boils down to two things, information and motivation. As with all businesses, one of the prime motivations from farming is profit maximization. How farmers go about making this profit has been ñexplainedò differently by several schools of thought. Normative economic models make the assumption that the farmer has perfect knowledge of all available options and that the farmer will make the rational choices to obtain the goal of profit or utility maximization. In reality, perfect knowledge is elusive and farmers make their decisions under conditions of uncertainty (Wolpert 1964; Harvey 1966; Foust and deSouza 1978; Berry *et al*. 1993). The farmers must account not only

for the desirability of outcomes but also their probability as well (Wolpert 1964). Because the outright profit maximization option often entails higher risk, a farmer may engage instead in a form of trade-off among alternative strategies to help the decision-making process. An attempt to quantify this process has often employed game theory (Gould 1963; Harvey 1966; Berry *et al*. 1993). Farmers using this strategy weigh the potential best and worst case outcomes along with the likelihood of these outcomes actually occurring to derive the optimal product mix. Because farmersô tolerance of risk differ, the desire for income stability is often just as important as profit maximization (Wolpert 1964).

Farmers tend to operate below the theoretical maximum or optimum (Wolpert 1964; Berry *et al*. 1993). The concept of satisficing behavior or bounded rationality accepts solutions that are ñgood enoughò even if they are not the optimum result (Simon 1957). In his classic study of farmers in middle Sweden, Wolpert (1964) found the average farmer only achieved two-thirds of the potential productivity that their resources would allow. He concluded that the gap between potential production and actual production meant that the farmers were either optimizers with imperfect knowledge or that they had goals other than profit maximization. On the other hand, while sometimes a farm may seem to be operating below its production potential, the household might actually be closer to the optimum when off-farm income and time constraints are considered (Nehring *et al.* 2002).

Farmersô decisions are managerial and entrepreneurial, short-term and strategically long-term (Bryant and Johnston 1992). Which decision-making model is

used depends on the unique circumstance of each farm. If the environment is stable with few variations of any significance, a strategy of growing the crop with the highest opportunity to maximize profits may be the best option (Berry *et al.* 1993). If uncertainty creates multiple possible outcomes, not all of them positive, then the farmer may want to maximize profits by diversifying his or her product base to hedge his or her bets and promote income stability. Operating under a more behavioral approach, farmers seek profits that are economically viable but, given their situation and needs, may be satisfied by operating at a suboptimal level (Wolpert 1964).

While profit is a very strong motivator, non-economic factors such as the farmerôs value system, goals, lifecycle stage, optimism, time constraints, and risk tolerance also influence the decision-making process. For example, a farmer with teenage children living at home has different needs to consider than a farmer in the empty-nest stage of life (Buse and Bromley 1975; Smithers and Johnson 2004). Regardless of lifecycle stage, some farmers are naturally more cautious while others are more willing to take a risk. Determinants of risk aversion include age of the farmer, size of the family, income needs, equity position, physical location, personality, and aspiration levels (Wolpert 1964). The degree of optimism about the future is often reflected in the long-term planning and investment decisions made on the farm (Harvey 1966). For example, among dairy and fruit/vegetable farms in the rural-urban fringe of Worcester, Massachusetts, Lockeretz *et al.* (1987) found that the majority of the farmers were optimistic about the agricultural future of their farms. The farmers had confirmed this optimism by continuing to make improvements on their farms in the previous five years.

Finally, psychic income is a factor to consider when evaluating a famerôs decision-making. Psychic income is the value attributed by farmers to non-economic factors that impact their decisions (Foust and deSouza 1978). This includes declining to sell the farm due to a personal attachment to the land or maintaining a hobby farm more for personal enjoyment than economic gain (Pyle 1989; Bryant and Johnston 1992).

Best farming practices evolve. The competitiveness of a farmer or region is often linked to the adoption or rejection of new ideas. Stimuli do not reach all farmers and reception of a signal does not necessarily mean that action will be taken. A farmer must be both open to change and have the capability to change (Bryant and Johnston 1992). First the farmer must gain knowledge of a technological innovation. This knowledge is gained through an opinion leader within his or her peer group, a change agent (e.g. agricultural extension agent, sales representative), the mass media, or observations of other farmersô practices. The innovation has to be perceived as having a relative advantage over the current technology or practice in terms of economic costs, time, or status (Rogers 1983; Leuthold 1987). The innovation has to be understandable as innovations that are too complex in reality or perception either may not be adopted or take longer to be accepted. Once the decision is made to accept the innovation, a trial period is initiated. This trial period lets the farmer determine whether to proceed to full implementation, make adjustments, or reject the innovation. If fully implemented, the farmer must confirm that the benefits outweigh any disadvantages. It is important that these benefits be observable for continued use. Because farmers communicate with other farmers with effect, an innovation that works is likely to induce other farmers in the same

social network to try the innovation on a trial basis (Leuthold 1987). Similarly, early adopters who discontinue use of an innovation significantly delay the transmission of that technology since other farmers receiving the negative message are less likely to give it a trial run (Rogers 1983; Leuthold 1987).

Discontinuance of innovations comes in three forms: forced, replacement, and disenchantment (Rogers 1983). The least common is forced discontinuance. In this case, the farmer has no choice in the matter such as a pesticide being taken off the market. Replacement discontinuance occurs when the farmer rejects an idea for a better available option at a lower cost. Disenchantment discontinuance happens when a farmer tries an innovation, but later abandons it due to his or her dissatisfaction with the results. For example, in a study on the adoption of precision soil sampling among cotton farmers, Walton *et al.* (2008) found that the farmers who abandoned the practice did so after a trial of 3.7 years. Possible reasons for its abandonment included: 1) the lack of field variability negated the need for precision applications to improve yields; 2) the soil samples indicated that they were already using best practices; and 3) the information gained through soil sampling was too costly or difficult to apply.

Regions, like individuals, can be classified according to the temporal rate of acceptance of a new technology or practice. A region can be an innovator, early adopter, late adopter, or laggard. This can lead to the widening of interregional competitive advantages. When regional lag is severe, as was the case of the mechanization of cotton farming on the Piedmont, the viability of once-dominant crops may no longer be sustained (Prunty and Aiken 1972; Aiken 1998).

Farm Exits

In the past 80 years, a great transformation based on improved efficiency has rippled through American farm society. Mechanization has doubled the real output of agricultural production while decreasing the need for labor by 70 percent (Ahearn *et al.* 1998). Along with mechanization came a switch from general farming, where the farm family produced a crop while also maintaining a few milk cows, chickens, and fruit trees, to a more specialized farming focused on one or two products. Mechanization also allowed for the consolidation of small, inefficient farms into larger farms benefiting from economies of scale. ñGet big or get outò has reduced the number of farms from 6.8 million in 1935 to 2.2 million in 2007. Of these 2.2 million farms, 59.8 percent had sales of $10,000 or less, implying a functionality of providing supplemental, but not primary, income. In fact, only 116,286 farms in 2007 accounted for 73.5 percent of all farm revenues (Hart 2003; USDA NASS 2009b).

After a significant previous decline, farm numbers have basically been stable since 1974. The small change in aggregate numbers masks the large number of farm entries and exits each year. For example, in the longitudinal Southwestern Wisconsin Panel Study, despite the lack of change in the aggregate proportion of farms earning $10,000 or less, 75 percent of operations in this category exited farming over a 10 year period. The lack of change in the aggregate proportion was due to the large number of continuing farms downsizing into that category (Jackson-Smith 1999). Overall, U.S. farm exits average 9ï 10 percent per year, comparable to the exit rates of other small businesses (Hoppe and Korb 2006). The reasons for exits range from career changes to

retirement (Gale 2003). Despite widespread press, bankruptcies are just a subset of farm exits and play only a minor role in the overall decline in the number of farms. The largest numbers of farm exits were during eras with lower bankruptcy rates (Stam and Dixon 2004).

Using data from the 2001 USDA Agricultural Resource Management Survey, Mishra *et al*. (2010) found that factors that tend to increase exit rates include the farmer getting older, the spouse working full-time off the farm, and situations where the farmerôs primary occupation is not farming. Factors that tended to decrease exit rates are farm families with teenage children, large farms with more than $500,000 in sales, and running beef cattle instead of other livestock operations. Those with more education were also less likely to exit, which the authors attribute to these farmersô better ability to process information, allocate resources, and evaluate new technology.

Two other studies on farm exits are related to the dairy industry. In an empirical study of 64 dairy farmers in the state of Maine, Bragg and Dalton (2004) found that if the expected long-run price of milk is higher than the cost of production, the farmer will continue despite the fluctuations in price. The likelihood of exits decreases with specialization only on dairy products. Larger herd sizes, control of feed costs, and computerization also reduce exits. Older farmers and a heavier reliance on off-the-farm income increase exits. Normally, part-time employment results in a lower likelihood of an exit but dairy farming is time-intensive (Hoppe and Korb 2006). Those not specializing are most likely not able to lower their costs enough to justify continued production in an era of low milk prices (Bragg and Dalton 2004). Similar results were

seen in Louisiana where higher milk prices decreased exits. In that state, small and medium-sized dairies were decreasing while large dairies were increasing in number (Rahelizavatovo and Gillespie 1999).

Two important variables that impact farm exit rates are the age of the operator and the size of the farm. According to Boehlje (1973), a farmerôs life cycle consists of three phases: (1) entry and establishment (2) growth and survival and (3) divestment. Most full-time farm entrants are in their twenties when making their career choice, often first working on the family operation. Most farmers start modestly due to a lack of financial resources as it is hard to get large loans until equity has been built up. Entry and exit rates of younger or mid-career farmers reflect the cyclical nature of the farm economy. Because these farmers tend to carry higher debt loads, they are more vulnerable to financial stress. As the person ages, the likelihood of an exit decreases until he or she gets closer to retirement age (Gale 1994, 2003). Due to the lack of liquidity in farm assets, it then becomes necessary for the farmer to cash out to provide for retirement (Blank 1998).

The size of the farm typically changes over the farmerôs lifespan. At any time, the number of farms that are growing are roughly equal to the number that are in the process of downsizing. Growth of a farm is rapid at first and slows as the farm matures. The average size farm for a farmer at age 20 is one-half the size of a farmerôs operation at age 45 (Gale 1994). ñLarge farmsò are less likely to exit than smaller farms, possibly reflecting their greater commercial viability. Large farms that are at least 14 years old and in which the operator is younger than age 65 have a particularly low exit rate. Small

recreational farms with annual sales of less than $10,000 have the highest exit rates among all farms (Hoppe and Korb 2006). The size of the farms with operators who are 65 years old average two-thirds the size of the farms with operators aged 45. This reflects the process of divestment of assets and the appeal of small, ñretirement farms.ò Older farmers tend to scale back their operations due to health concerns, income earned from leasing land, and selling some assets for retirement income (Gale 1994). Older farmer exit rates have, however, declined and more farmers are farming longer, at least on a part-time basis (Hoppe and Korb 2001).

In addition to the age of the farmer and size of the farm, succession of a farm also is an important factor in how one handles the farm. A large amount of family wealth is tied up in non-liquid farm assets. The human element is important; farm succession is more than just profit-maximizing. Many farmers have altruistic motives as they want to pass an economically viable operation down to a family member (Mishra *et al.* 2004). Forms of financial assistance to these new owners within the family include gifts of cash or equipment, inheritances, and the creation of parent-child partnerships. Farmers who have children who are likely to take over the business are more likely to continue to make improvements on the farm (Smithers and Johnson 2004). In a study of farmers near Paris, the settlement money given to farmers for land taken by the French government for expansion of a major airport was more likely reinvested in farming if there was a successor. If there was no planned successor, then the money received was mostly spent on non-farm investments (Bryant and Johnston 1992).

Many farmers do not have a succession plan as there has been a decline in younger farming entrants. One reason for the decline in new entrants is the shrinking pool of potential farmers as the farm population declines through attrition and lower birth rates (Gale 2003). High entry costs are another barrier. In central Pennsylvania, an area experiencing an increase in urban development, farmers noted that it was difficult for an individual to enter farming without inheriting land or equipment (Ferry and Brock 2003). An even more common reason for the decline in farm entrants is occupational choice. Before he or she begins, a potential farmer evaluates expected returns from farming versus other career alternatives (Boehlje 1973; Gale 1994, 2003).

Pessimism about the outlook of farming plus personal lifestyle preferences have steered many away from farming. For example, alternative career options for the next generation factored in the decline of the southern Piedmont cotton belt and the Pleasant Valley, Iowa onion district (Aiken 1998; Bell and Gripshover 2002). Only 24 percent of farmers in Smithers and Johnsonôs (2004) study of Huron County, Ontario were actively contemplating succession of the farm within the family while most farmers thought other occupational fields would provide their children with a more rewarding future than staying in agriculture. In Zollinger and Krannichôs (2002) study of Utah farmers, more farmers said that a child would not be taking over the farm than the likelihood of intergenerational succession. Not having someone to whom the farm can be passed down increased the likelihood of selling the land for non-agricultural purposes. Farms located in areas of high land values were particularly vulnerable to this fate when non-farming heirs received the land upon the death of the farmer (Berry 1978).

Finally, the role of a farmerôs intrinsic enjoyment of his or her job when contrasted with the possibility of selling the farm for a high price must be considered. In a study by Lockeretz *et al.* (1987), the main reason why farmers continued to farm in Worcesterôs (MA) rural-urban fringe was overwhelmingly because they enjoyed farming. Only 35 percent of respondents listed economic reasons in their top three responses as to why they farm. In fact, many farmers would state that they ñcould make a lot more money if they sold the farm and lived off the interestò (Lockeretz *et al.* 1987, 58). Farming is considered a way of life in which farmers are often willing to ñexploitò their own labor and economic potential to remain in business (Buse and Bromley 1975). Zollinger and Krannich (2002) found that the farmers they interviewed felt their occupations and the areas where they farmed to be intrinsically satisfying. Their quantitative analysis of farmersô survey responses revealed that this satisfaction was not enough however, to prevent the farmers from selling their land. Maintaining profitability proved more important in the farmersô ultimate decision to sell their land. However, those farmers expressing high levels of intrinsic job satisfaction were more likely to relocate and continue farming if selling the farm at its current location were to be necessary. In Pyleôs (1989) study of persistent landownership in the Lexington, Kentucky area, both the need to continue to farm all their land and a personal attachment to the land were the driving reasons in the farmersô refusal to sell land. Family and lifecycle factors trumped financial reasons in the decision of landowners to sell land in the study by Brown *et al*. (1981) of six metropolitan areas in the United States and Canada. While farmers must maintain a minimum economic performance to remain

viable, personal values also play an important role in land-use decisions (Lockeretz *et al.* 1987).

CHAPTER 3: THE SHENANDOAH-CUMBERLAND VALLEY FRUIT DISTRICT

Separated by the Potomac River, the Cumberland Valley and Shenandoah Valley are two subsets of the Great Valley that runs from New York to Alabama (Greene and Benhart 1992; Hawkins 2002; Fermata Inc. 2009). Bookended by the cities of Harrisburg (PA) and Harrisonburg (VA), the Shenandoah-Cumberland Valley Fruit District runs approximately 165 miles in a southwesterly direction from the Cumberland Valley of south central Pennsylvania into the Shenandoah Valley of northwestern Virginia (Figure 3.1). While many of the Fruit Districtôs orchards are located in the Great Valley, the orchards of Adams County, Pennsylvania are located in the Piedmont province east of the Great Valley. The Fruit District also includes orchards located in the Appalachian Ridge and Valley province west of the Great Valley (Williams 2002). Although divided among four states, the areaôs topography and transportation networks unify the region to some degree. Favorable conditions for apple production include the rich limestone soils, a clay base to hold moisture, and a gently rolling terrain for easy maintenance of the orchard. Natural rises in the topography such as Apple Pie Ridge in Virginia and West Virginia and the South Mountain Fruit Belt in Adams County also encourage the air circulation that deters spring frosts (Cotrill 1993; Pillsbury and Florin 1996; Feather 2001; Fermata Inc. 2009; Komencheck 2010).

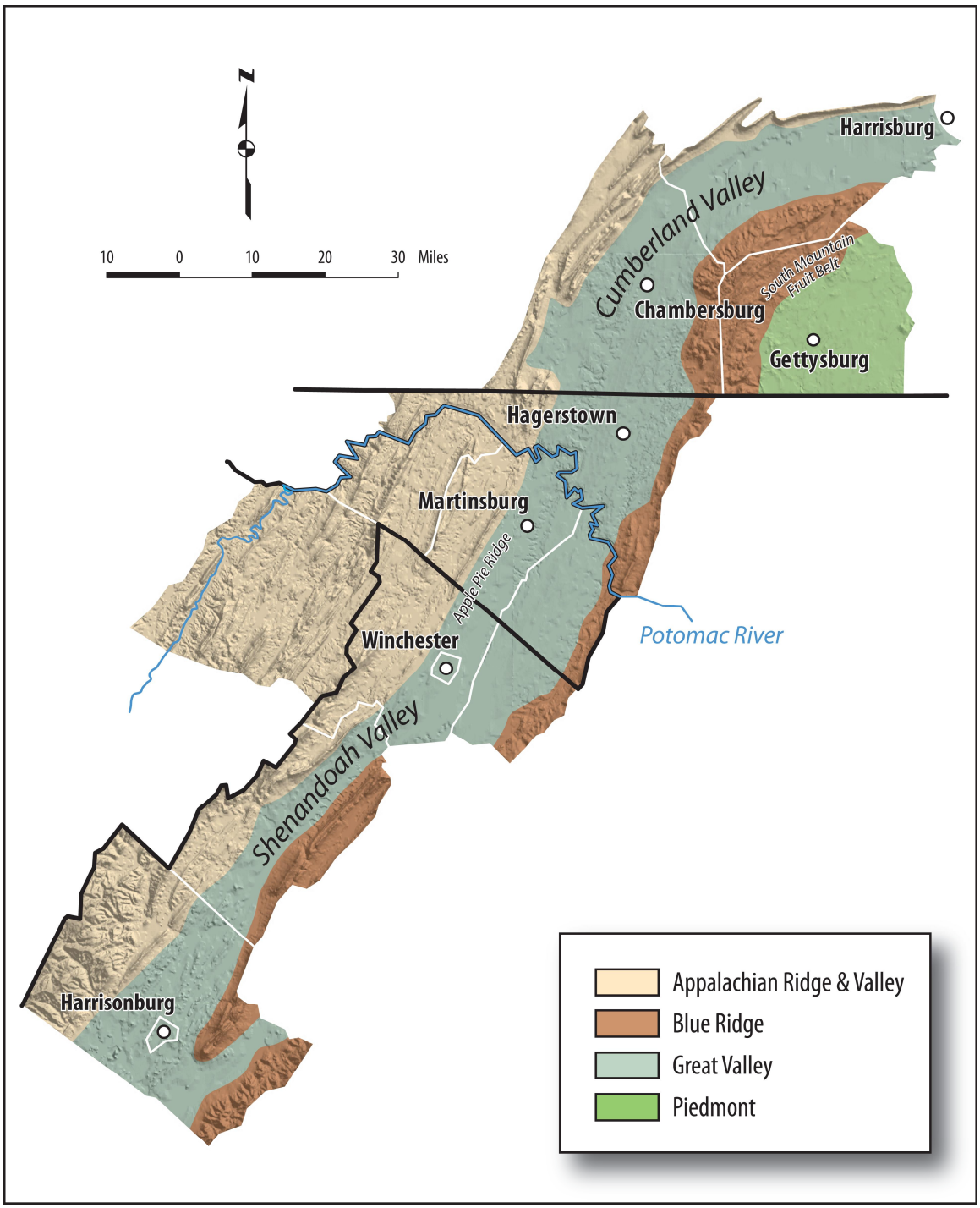


Figure 3.1 Physical Regions of the Shenandoah-Cumberland Valley Fruit District

Map by Will Fontanez and Joseph P. Guttmann

The county unit was used to define the study area because it is the smallest areal unit used by the Census of Agriculture for apple acreage statistics. Counties were included in this definition of the Shenandoah-Cumberland Valley Fruit District if the county had a minimum of 1,000 acres in apples in the 1982 Census of Agriculture. Frederick County, Maryland, contiguous to the Fruit District, did not make the 1,000 acre threshold but a small cluster of orchards near Catoctin Mountain were included in the mail survey because of their proximity to Adams County, Pennsylvania. Taken as a whole, the Shenandoah-Cumberland Valley Fruit District trails only the Lake Michigan Fruit Belt and the Western New York Fruit Belt in acreage devoted to apples east of the Mississippi River. With 12,402 acres, Adams County (PA) is the leading apple producer in the Shenandoah-Cumberland Valley Fruit District and ranks fifth by acreage nationally (USDA NASS 2009b).

A Brief History

Commercial orchards began in the Shenandoah-Cumberland Valley Fruit District in the 1870s. Improved transportation networks and the development of large-scale apple processing facilities were just as critical to the growth of the emerging Fruit District as its natural endowments (Morton 1925; Smock and Neubert 1950; Pillsbury and Florin 1996; BHHC 1999; Horst 1999; Feather 2001; Nagurny 2002; Kyriakoudes 2003). By 1921, the Shenandoah-Cumberland Valley Fruit District was noted for its intensive plantings, compactness in size, high orchard yields, and growth in the annual amount of apples being produced. The area was also noted for the availability of cheap labor (Folger and

Thomson 1921). One expert commented that ñthe mountain valleys are well supplied with people of primitive ways of living, who are good, willing workers, easily taught, and are content with low wagesò (Wilkinson 1915, 449). Frederick County, Virginia and Berkeley County, West Virginia were annually producing over 500,000 barrels of apples while Adams and Franklin counties in Pennsylvania were each producing over 250,000 barrels (Folger and Thomson 1921). Industrial employment in the burgeoning apple processing sector was second only to textiles in both Berkeley County (WV) and Winchester (VA) (Table 3.1) (Doherty 1972; Morton 1925). While mixed farming still dominated the region in terms of acreage, it was the fruit industry that distinguished the area. Winchester, Virginia was the self-proclaimed ñapple capitalò and held its first Shenandoah Apple Blossom Festival in 1924 (Couper 1952).

Table 3.1 Largest Industrial Employers in Berkeley County, West Virginia and Winchester, Virginia — Mid-1920s

1924 Berkeley County	1925 Winchester
Interwoven Mills (1470)	Virginia Woolen Mills
Berkeley Woolen Mills (300)	***National Fruit***
Musselman (250)	***Winchester Cold Storage***
B & O Railroad (201)	***Robinson Ice & Cold Storage***
Dunn Woolen Mills (170)	Lewis Jones Knitting
National Fruit (65)	***Shenandoah Valley Apple, Cider, and Vinegar***
Perfection Garment (64)	Winchester Woolen Mills
	Owen and Trenary Glove

Note: Employee numbers in parenthesis, if known Source: Doherty 1972, Morton 1925
Fruit-related businesses in italics

In the 1950s, the Appalachian area, a region which combines the Virginia Piedmont and southern Virginia fruit districts with the core Shenandoah-Cumberland Valley Fruit District, was producing one-fifth of the nationôs apples (Evans 1957). The Appalachian region ranked second in national production, trailing only Washington State. Around one-half of the apples harvested in the Appalachian region were used for processing purposes. Consumption of commercial canned apple products had risen rapidly in post-WWII America and the Appalachian region produced almost half of the nationôs supply of applesauce and apple slices. C.H. Musselman Company and the Knouse Foods Cooperative of Adams County (PA) and the National Fruit Product Company of Winchester (VA) were the largest processors based in the Fruit District in the late 1950s.

The early 1980s were the recent high water marks for the Shenandoah-Cumberland Valley Fruit District in terms of apple acreage and apple production. In 1982, the Shenandoah-Cumberland Valley Fruit District had 58,401 acres in apples (USDA SRS 1984a). In addition to apples, the Fruit District had 12,153 acres in peaches and several thousand more acres combined in cherries, plums, and pears. In 1982, apple production in the four-state region amounted to 1,335 million pounds (USDA SRS 1984b). This figure includes the production for the entire four states, not just the counties in the Shenandoah-Cumberland Valley Fruit District. The Shenandoah-Cumberland Valley Fruit District accounts for 71 percent of the apple acreage in the four-state region (Table 3.2).

Since 1982, apple acreage in the Fruit District has declined 49.8 percent to 29,342 acres (Table 3.3). Peach acreage has had an even steeper decline at 67.5 percent (USDA NASS 2009a). At first, apple acreage declines were rather moderate. The Census of Agriculture reported declines of around 5,000 acres each for the 1987 and 1992 censuses. The declines in apple acreage during this period ran counter to the national trend of increasing apple acreage. Overall apple acreage in the Shenandoah-Cumberland Valley Fruit District was stable between 1992 and 1997 (Table 3.3). A modest acreage decline in some counties was countered by a 2,300 acre gain in Adams County (PA). This stabilization in apple acreage mirrored the national trend (USDA NASS 2009a). Following the 1997 census, the Shenandoah-Cumberland Valley Fruit District experienced a steeper decline in apple acreage, losing around 19,000 acres in a 10 year period. During this period, China entered the apple juice concentrate market, processing prices stagnated, input costs continued to increase, and an economic boom caused land prices to rise (Edwards 2004). The decline in apple acreage has not been evenly spread throughout the Shenandoah-Cumberland Valley Fruit District. Since 1982, the West Virginia counties in the Fruit District have lost 73.7 percent of their apple acreage while the Pennsylvania counties have only experienced a 31.8 percent decline. Virginiaôs apple acreage has declined by 49.3 percent, close to the Fruit Districtôs average (USDA NASS 2009a).

Table 3.2 Statewide Commercial Apple Acreage Located in the Shenandoah - Cumberland Valley Fruit District

State	Percentage
Pennsylvania	68.9
Maryland	62.5
West Virginia	95.5
Virginia	67.2
Total	**71.0%**

Sources: USDA, NASS *2004 West Virginia Orchard & Vineyard Survey; 2005 Virginia Orchard Survey; 2007 Census of Agriculture; Pennsylvania Orchard and Vineyard Statistics 2008*

Table 3.3 Shenandoah-Cumberland Valley Fruit District Apple Acreage

County	1982	1987	1992	1997	2002	2007	Acres Change 1982–2007	Percentage Change 1982–2007
Adams PA	15,625	15,598	14,213	16,513	14,225	12,402	ï 3,223	ï 20.6%
Franklin PA	4,808	4,977	4,616	3,617	2,999	1,757	ï 3,051	ï 63.5%
Cumberland PA	1,100	937	885	914	287	532	ï 568	ï 51.6%
Washington MD	4,556	2,100	1,264	1,431	1,570	1,411	ï 3,145	ï 69.0%
Berkeley WV	7,197	6,783	6,593	5,824	4,498	2,698	ï 4,499	ï 62.5%
Jefferson WV	3,813	2,871	1,906	1,309	677	527	ï 3,286	ï 86.2%
Hampshire WV	3,824	3,727	1,402	1,835	1,254	996	ï 2,828	ï 74.0%
Morgan WV	1,538	580	444	485	400	*80*	ï 1,538	ï 94.8%
Frederick VA	8,731	8,602	9,068	9,017	7,442	5,600	ï 3,131	ï 35.9%
Clarke VA	3,745	3,700	3,294	2,731	2,056	590	ï 3,155	ï 84.2%
Shenandoah VA	1,798	1,721	2,539	2,375	*2,316*	*1,449*	ï 349	ï 19.4%
Rockingham VA	1,666	1,828	1,873	1,400	1,546	*1,300*	ï 366	ï 22.0%
Total	**58,401**	**53,424**	**48,097**	**47,451**	**39,270**	**29,342**	**–29,059**	**–49.8%**

Note: Numbers in *italics* were not disclosed by the *Census of Agriculture* because of privacy issues. The acreage totals for Shenandoah County in 2002 and 2007 were taken from the USDA NASS *2005 Virginia Orchard Survey*. Acreage total for Morgan County and Rockingham County in 2007 are estimates based on the authorôs Mid-Atlantic Apple Survey.

Source: USDA *Census of Agriculture*

The declines in apple acreage in the Shenandoah-Cumberland Valley Fruit District have not been matched by equal declines in total apple production in the four states. While the Fruit Districtôs apple acreage has declined by 49.8 percent, apple production in the four states has only declined by 36.1 percent since 1982 (Table 3.4). As with all production numbers based on a single season, fluctuations occur from year to year but the years chosen for comparisons in Table 3.4 are felt to accurately reflect the general production trends for the four-state region. Once again, there is a geographic disparity with West Virginiaôs production declining 65.7 percent since 1982 and Pennsylvaniaôs only declining by 8 percent. One possible explanation is a high rate of growers in Pennsylvania who adopted high-density plantings which has increased the output per acre relative to the other states. By contrast, Virginiaôs acreage decline of 49.3 percent is almost equal to its production decline of 51 percent. Maryland experienced a decline in production from 1982 to 1991 but has since stabilized while West Virginiaôs steepest drop in production occurred between 1991 and 2001. Whereas the ñAppalachian Areaò was the nationôs second largest producer of apples in the 1950s, based on the average utilized production for the 2007-2009 seasons, the four-state region had now fallen significantly behind New York and was about even with Michiganôs average annual output (Evans 1957; USDA NASS 2010c).

Table 3.4 Statewide Apple Production (million lbs.)

State	1975	1982	1991	2001	2009
Pennsylvania	503	525	470	480	483
Maryland	79	80	50	41	46
West Virginia	216	230	225	105	79
Virginia	395	500	370	306	245
Total	**1193**	**1355**	**1132**	**932**	**853**

Source: USDA, NASS *Noncitrus Fruits and Nuts Summary* (various years)

Other Agriculture Pursuits Within the Fruit District

While the apple industry has long helped define the agricultural identity of the Shenandoah-Cumberland Valley Fruit District, other agricultural commodities are also vitally important to the overall economy. This is especially true outside of the three primary fruit-producing counties of Adams (PA), Frederick (VA), and Berkeley (WV). These counties are the only three where fruit is ranked among the top two commodities by value and where fruit accounts for over 10 percent of a county's agricultural production value (Table 3.5). In the other counties, animal products dwarf the production value of raw fruit. Higher values for animal production are in part nature-based because cows are milked every day, chickens lay eggs nearly every day, and broiler chickens have a short life cycle. Cattle and calf operations are common in all parts of the Shenandoah-Cumberland Valley. Many of these are small operations. The dairy industry is most important in the Cumberland Valley and Rockingham County (VA). Likewise, the poultry industry based on high-volume broiler, turkey, and egg production is concentrated in Rockingham County (VA) and the Pennsylvania counties. In terms of

acreage, hay is the leading use of cropland in all counties (USDA NASS 2009c). Corn, and to a lesser extent, soybeans and wheat are also major consumers of land in the more level sections of the Fruit District. Much of the local grain is consumed by the poultry and dairy industries (Coughlin 1997). Fruit is ranked in the top five by acreage in seven counties: Adams (PA), Berkeley (WV), Hampshire (WV), Morgan (WV), Frederick (VA), Clarke (VA), and Shenandoah (VA) (USDA NASS 2009c).

Table 3.5 Value of Agriculture, by County (2007)

County	Value of Fruit ($1,000)	Fruit as Percentage of Total Ag. Value	Total Agricultural Value ($1,000)	Top Commodity by Value	Value ($1,000)	Second Commodity by Value	Value ($1,000)
Adams	$45,367	20.9%	$216,994	Poultry	$84,421	***Fruit***	$45,367
Frederick	16,119	57.7	27,957	***Fruit***	16,119	Cattle	5,638
Berkeley	10,081	46.4	21,715	***Fruit***	10,081	Cattle	3,208
Franklin	8,097	2.7	304,450	Dairy	159,263	Poultry	52,564
Washington	6,558	7.8	83,691	Dairy	45,271	Grains	8,201
Rockingham	6,071	1.1	534,142	Poultry	378,339	Dairy	84,904
Shenandoah	4,073	4.0	101,576	Poultry	65,988	Cattle	16,014
Cumberland	1,905	1.4	132,805	Dairy	58,006	Cattle	25,120
Clarke	1,861	8.5	21,901	Cattle	6,933	Dairy	5,875
Hampshire	1,598	4.9	32,549	Poultry	20,549	Cattle	8,219
Jefferson	1,386	7.1	19,459	Dairy	7,341	Grains	4,881
Morgan	NA	NA	1,851	Cattle	612	Hay	349

Source: USDA, Census of Agriculture 2007 *County Profiles*

Sub-Regions of the Shenandoah-Cumberland Valley Fruit District

One of the main purposes of this dissertation is to determine why the apple acreage in some areas of the Fruit District had declined faster than in other areas. To aid in making these geographic comparisons, this study divides the Shenandoah-Cumberland Fruit District into four sub-regions: Adams County (PA), the Cumberland Valley, West Virginia, and Virginia (Figure 3.2). Divisions were based on political boundaries, geographic characteristics, and the number of grower responses from the mail survey. Two sub-regions are self-explanatory. The Virginia and West Virginia sub-regions consist of the counties within each respective state. While both sub-regions have experienced high rates of population growth and large declines in apple acreage, important differences exist in the scale of each stateôs apple industry (Table 3.6). For example, the size of the industry affects the resources available to state apple associations and the provision of state agricultural research and extension services.

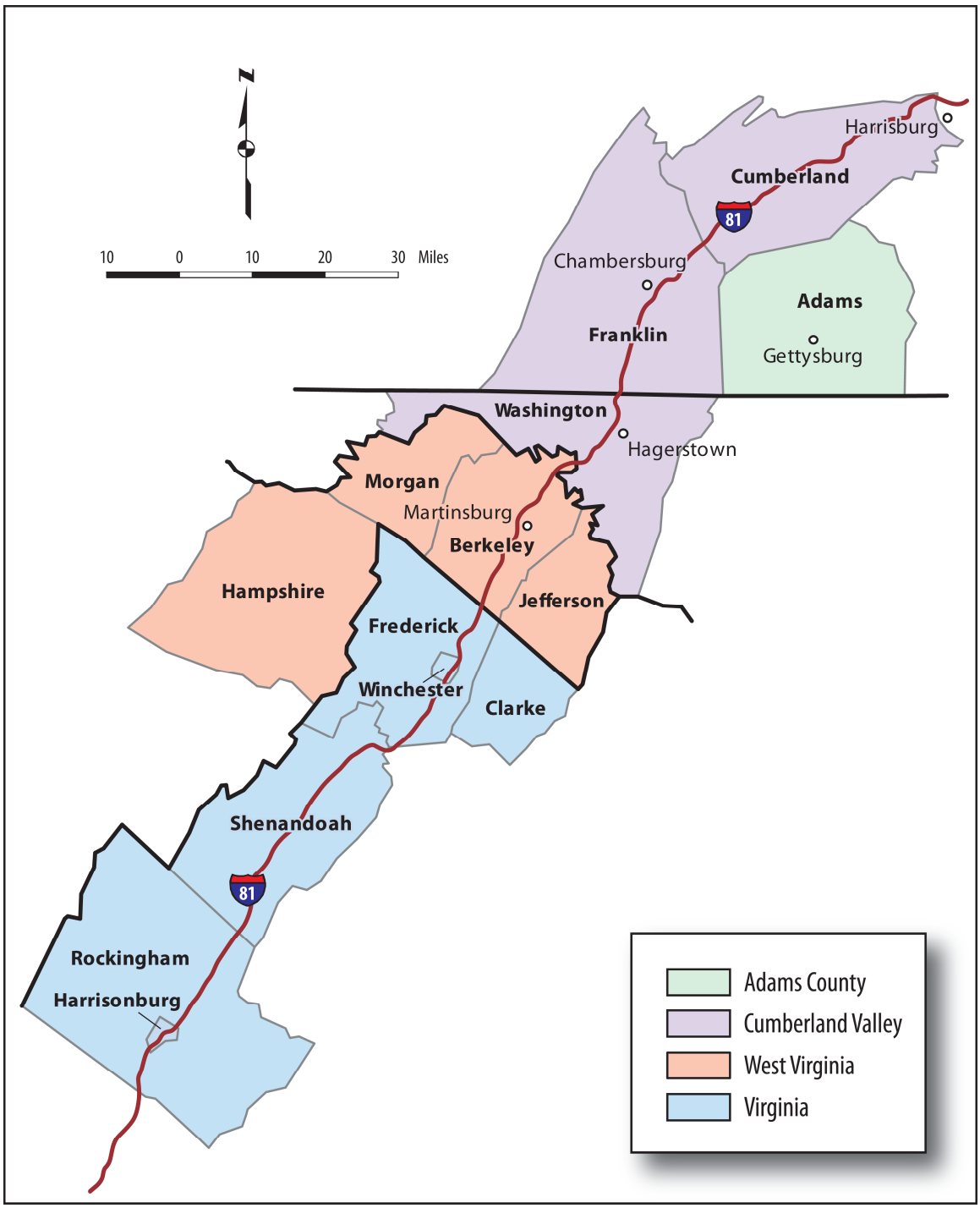


Figure 3.2 Sub-Regions of the Shenandoah-Cumberland Valley Fruit District

Map by Will Fontanez

Table 3.6 Comparison of Shenandoah-Cumberland Valley Fruit District Sub-Regions

	Adams County	West Virginia	Virginia	Cumberland Valley	Total
Acres in Apples 2007	12,402	4,301	8,939	3,700	29,342
Percentage of Fruit Districtôs Apple Acreage	42.3%	14.7%	30.5%	12.6%	100.1%
Acres in Peaches 2007	1,821	1,031	254	848	3,954
Value of Fruit (1000ôs) 2007	$45,367	$13,065	$28,124	$16,560	$103,116
Acres in Apples 1982	15,625	16,372	15,940	10,464	58,401
Change in Apple Acres 1982-2007	-3,223	-12,071	-7,001	-6,764	-29,059
Percentage Change in Apple Acres 1982-2007	-20.6%	-73.7%	-43.9%	-64.6%	-49.8%
Population 1980	68,292	102,655	168,600	405,256	744,803
Population 2010	101,407	199,172	285,763	532,454	1,118,796
Percentage Population Growth 1980-2010	48.5%	94.0%	69.5%	31.4%	50.2%

Source: USDA, Census of Agriculture; U.S. Census Bureau

The other two sub-regions are the stand-alone Adams County (PA) and the Cumberland Valley (Figure 3.2). The Cumberland Valley sub-region consists of Franklin and Cumberland counties in Pennsylvania and Washington County and the Catoctin area of Frederick County in Maryland. I defined a Cumberland Valley sub-region for several reasons. While there was a good mail survey response rate from the growers of Maryland (68.4 percent), there were just too few Maryland growers to represent a separate sub-region. Maryland only had 13 grower responses compared to 77 respondents from Pennsylvania, 34 from West Virginia, and 26 from Virginia. One Maryland grower's response would have had too much influence on the final percentages making state comparisons less reliable. Combining the Maryland grower responses with those from all

of the growers from Pennsylvania was also not ideal. While Maryland growers have more social and business links with Pennsylvania growers than with West Virginia or Virginia growers, the Maryland growers' responses would be difficult to differentiate because of the large number of Pennsylvania growers. Because Adams County (PA) contributed 42.6 percent of the total valid survey responses, Adams County could stand on its own as a separate sub-region. Combining the Maryland counties with Franklin and Cumberland counties in Pennsylvania also makes sense from geographic and acreage trend standpoints. With the exception of the Catoctin Mountain area orchards in Frederick County (MD), the orchards of Washington (MD), Franklin (PA), and Cumberland (PA) counties are all located within the geographic confines of the Cumberland Valley. South Mountain creates a natural break between Adams County (PA) and the other two Pennsylvania counties (Figure 3.1). In addition, apple acreage declines in the Cumberland Valley counties have ranged from 51.6 percent to 69 percent since 1982 while Adams County has only declined by 20.6 percent (Table 3.3).

The following sections will give a more in-depth look at the four sub-regions by describing the physical topography, areas of orchard concentration, and the infrastructure of the apple industry in each sub-region.

Adams County

Separated from the Cumberland Valley by South Mountain, this extension of the Blue Ridge Mountains runs the length of Adams Countyôs (PA) western and northwestern boundaries with Franklin and Cumberland counties (Figure 3.1). Paralleling South Mountain is the South Mountain Fruit Belt. Almost all of Adams

Countyôs apple acreage is located within the South Mountain Fruit Belt and the South Mountain Fruit Belt has the highest concentration of orchards in the entire Shenandoah-Cumberland Valley Fruit District (Figure 3.3). In some areas, it is literally back-to-back-to-back orchards. To the east of the South Mountain Fruit Belt, the land flattens out and grain and hay fields dominate the landscape. The road network converges on Gettysburg, the largest city in Adams County with a population of 7,620 (U.S. Census Bureau 2011). While there are no interstates in Adams County, the north-south U.S. Route 15 is a limited-access highway along most of its mileage through the county.

Adams County leads both the state of Pennsylvania and the Shenandoah-Cumberland Valley Fruit District in apple acreage and the value of its fruit production. Adams County accounts for 60 percent of the stateôs total apple acreage and 42.3 percent of the Fruit Districtôs total apple acreage (Table 3.6) (USDA NASS 2008). The countyôs $45,367,000 return on its fruit production equals 30 percent of Pennsylvaniaôs total value of fruit production and 44 percent of the Shenandoah-Cumberland Valley Fruit Districtôs total value of fruit production (Table 3.5) (USDA NASS 2009c). While apples account for the bulk of Adamôs Countyôs fruit production, the county also has 2,579 acres planted in other types of fruit. Despite still recovering from an outbreak of plum pox which necessitated the large-scale removal of peach trees, Adams leads the Shenandoah-Cumberland Valley Fruit District in peach acreage and is the only county with significant acreage planted in tart cherries (Table 3.6) (*Fruit Grower News* 2008; USDA NASS 2009b; Lehnert 2012a). The county also has several wineries.

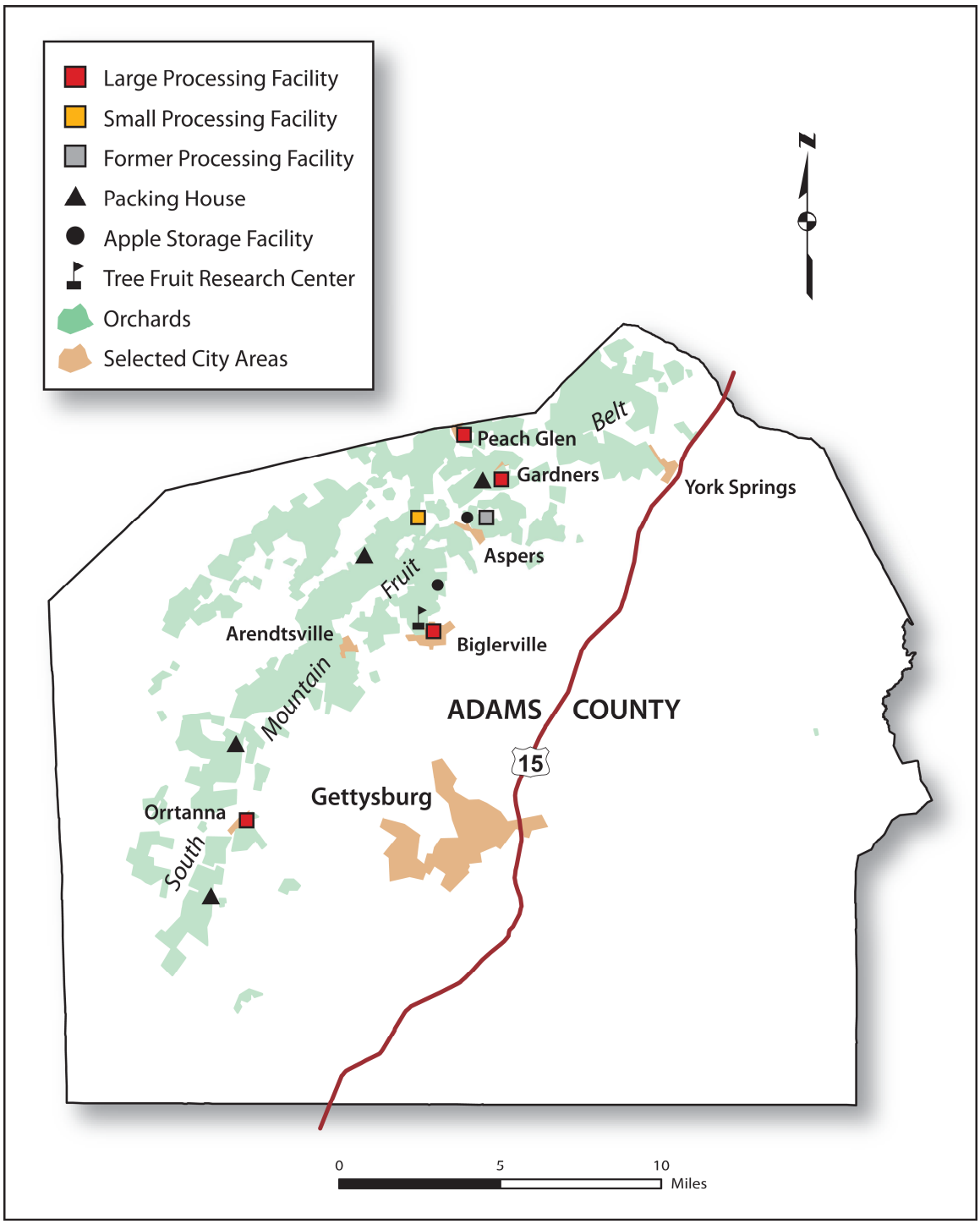


Figure 3.3 Map of Adams County

Note: Only apple storage facilities that are not part of a larger processing facility or packinghouse are included on the map.

Map by Will Fontanez and Joseph P. Guttmann

Just over half of the apple acreage in Adams County is maintained primarily for the fresh market (USDA NASS 2008). Rice Fruit Company in the small Adams County town of Gardners (PA) operates the largest apple packing facility in the eastern United States. Around 20 percent of apples packed at its facility come from orchards operated by the Rice family with the rest coming from about 50 growers who are mostly located within 25 miles of the packing plant (Rice 2010; Rice Fruit Co. 2010a). The county's three medium-sized packers – Bear Mountain Orchards, Bream Orchards, and El Vista Orchards – all have their packing facilities located on the farm (Figure 3.3; Figure 3.4).



Figure 3.4 Example of a Medium-Sized, On-the-Farm Packinghouse in Adams County

From left to right - tall gray cube building is Controlled Atmosphere (CA) storage, long building with windows is the packing line, small white annex in front is the office, and tall green building with no windows is regular cold storage. The loading docks for trucks are located in the back; Adams Co. PA
Photograph by Joseph P. Guttmann

Most of the fruit that is not sold in the fresh wholesale or direct markets is sold to the Knouse Foods growersô cooperative for processing. Knouse has over 1,000 employees working at four processing facilities in Adams County. Its corporate headquarters is located in Peach Glen, a small hamlet that consists of the factory and a few houses near the border with Cumberland County (PA). Other Knouse processing plants in Adams County are located in Biglerville, Orrtanna, and Gardners (Figure 3.3; Figure 3.5) (Knouse Foods 2010). While Knouse is one of the major players in the national market, Kimes Cider Mill distributes its products regionally. With changes in government regulations, wholesale cider sales to supermarkets and other outlets have been limited to operations like Kimes that have invested in pasteurization equipment (PASA 2006).

Adams County is also home to the two Shenandoah-Cumberland Valley Fruit District based nurseries that supply trees to the commercial orchards. In addition to selling commercial fruit trees, Boyer Nurseries and Orchards has an on-the-farm fruit market, a pick-your-own operation, sells produce at farmersô markets, offers landscaping services, and is heavily involved in selling ornamentals at their garden center. This marketing approach contrasts with the Adams County Nursery which specializes only in commercial fruit trees (Boyer 2007). Adams County Nursery has a national customer base and advertises in the leading fruit industry trade magazines (Figure 3.5). Boyer Nurseries, the Adams County Nursery, and the Grower Equipment Center also sell specialized orchard equipment. The packinghouses, processing facilities, tree nurseries, and other infrastructure for the fruit industry are all located in the small towns or on the farms in the South Mountain Fruit Belt.



Figure 3.5 Apple Industry Infrastructure of Adams County, PA

Top Row ï Knouse Foods processing plants in Biglerville and Orrtanna. *Center* ï Sign for the premier commercial fruit tree supplier in the Fruit District *Bottom Left* ï Kimes Cider Mill, a small processor in Bendersville *Bottom Right* ï Rice Fruit Company ñThe Eastôs Leading Fresh Fruit Packerò in Gardners; Adams Co. PA

Photographs by Joseph P. Guttmann

West Virginia

Locally known as the Eastern Panhandle, the West Virginia sub-region contains four counties within the state: Jefferson, Berkeley, Morgan, and Hampshire (Figure 3.6). The eastern one-fifth of Jefferson County (WV) consists of the Blue Ridge paralleled by the Shenandoah River. The rest of Jefferson County and more than one-half of Berkeley County (WV) is in the gently undulating Lower Shenandoah Valley. The Appalachian Ridge and Valley province begins with North Mountain in western Berkeley County and continues westward through Morgan (WV) and Hampshire (WV) counties (Figure 3.1). The mostly shale valleys in this province are less agriculturally productive than the limestone-based Shenandoah Valley. The largest city in the sub-region is Martinsburg with a population of 17,227 (U.S. Census Bureau 2011).

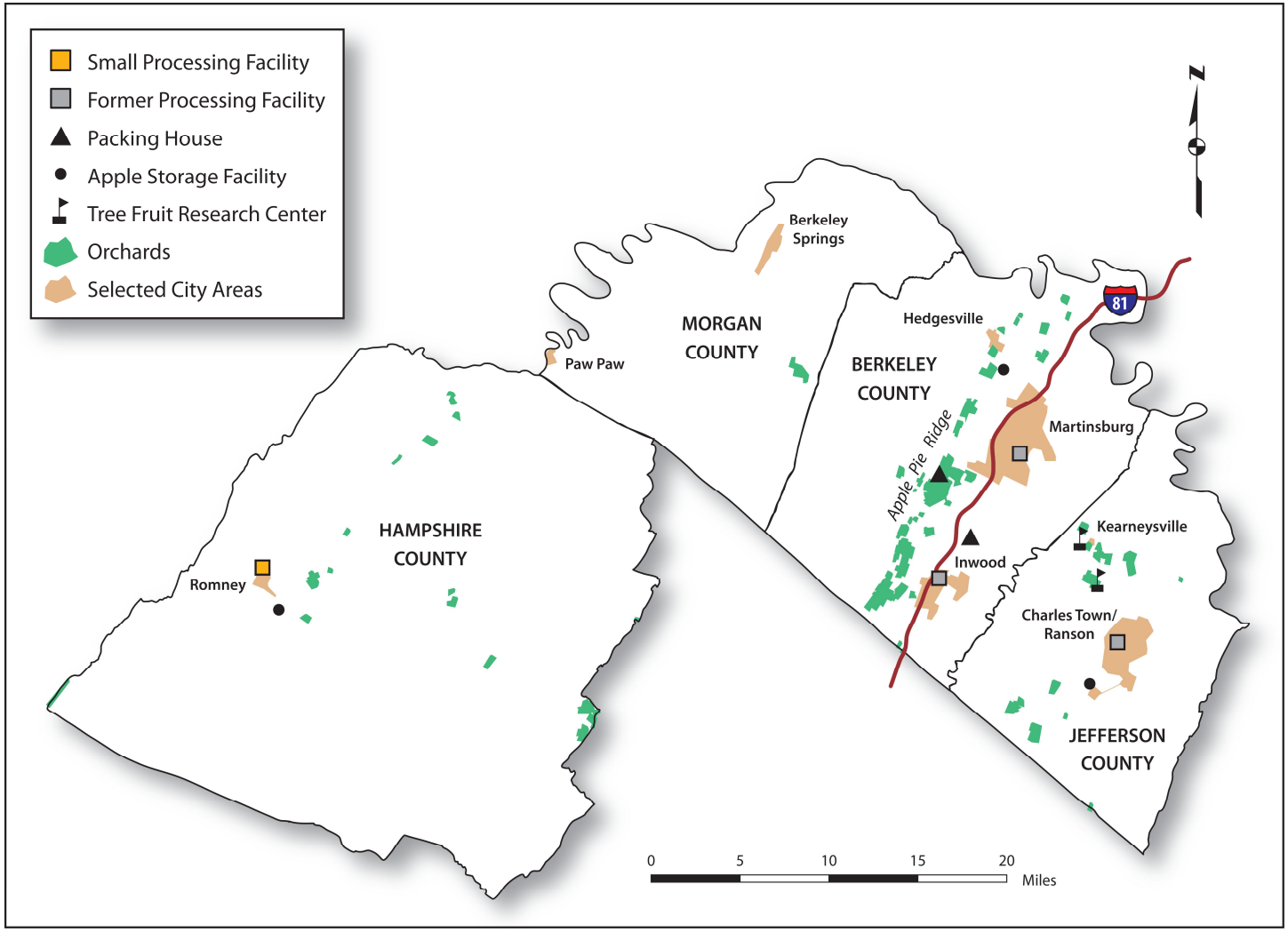


Figure 3.6 Map of the West Virginia Sub-Region

Map by Will Fontanez and Joseph P. Guttmann

In 2007, the West Virginia sub-region had 4,301 acres in apples accounting for 14.7 percent of the total apple acreage in the Shenandoah-Cumberland Valley Fruit District (Table 3.6). Much of this acreage is located on Apple Pie Ridge, a small rise of land that runs the length of Berkeley County (WV) parallel to North Mountain and continues into Virginia (Figure 3.6). A small cluster of orchards is located near the unincorporated village of Kearneysville in Jefferson County (WV). Both the West Virginia University Tree Fruit Research and Extension Center and the USDAôs Appalachian Tree Fruit Research Station are located in this area. A few isolated orchards are also scattered across the Valley. In Hampshire County (WV), orchards are located along Jersey Mountain, a plateau in the central part of the county, and there is some spillover of orchards from across the border with Frederick County (VA). The West Virginia sub-region has over 1,000 acres in peach trees, trailing only the Adams County (PA) sub-region. At one time, the National Peach Council was headquartered in Martinsburg, WV (Young 1993). Apples and peaches provide most of the $13 million in fruit receipts from the West Virginia sub-region (Table 3.6).

In 1982, the West Virginia sub-region contained a higher amount of apple acreage than the other three sub-regions of the Shenandoah-Cumberland Valley Fruit District (Table 3.6). Since then, apple acreage in the West Virginia sub-region has declined by 12,071 acres, a loss of 73.7 percent since 1982. Berkeley County (WV) has lost the most total acres but the other West Virginia counties have lost higher percentages of their apple acreage (Table 3.3). While Berkeley County did not start losing substantial apple acreage until after 1992, its Shenandoah Valley counterpart, Jefferson County (WV), has

been experiencing sizable declines since 1982. Serious losses of apple acreage also began occurring prior to 1992 in the Appalachian Ridge and Valley counties.

The decline of the West Virginia apple industry is not limited to acreage losses and production declines. Large processing facilities are no longer located in the sub-region. After 66 years in operation, National Fruit Product Company closed its Martinsburg (WV) plant in 1985. Waste disposal problems at the Martinsburg plant and increased production capacity at National Fruitôs Winchester (VA) facility led to the consolidation of production in Winchester (Huehn 1993; NFPC 2010). Citing a lack of apples in the area and the expense of updating equipment, Knouse Foods closed its applesauce plant in southern Berkeley County in 2008 (Cox 2008; Guise 2010). Local growers now must send processing apples directly to the processors in Pennsylvania and Virginia or to the local cold storage facilities where the apples are later hauled by the processors to their plants (Guise 2010; Miller 2010). The only processor remaining in the sub-region is Gourmet Central in Romney (Hampshire County, WV), a small specialty foods maker that produces private-label apple butters and fruit spreads for some of the growersôon-the-farm retail operations (Martin and Martin 2010; Orrs 2010). All is not doom and gloom in the West Virginia sub-region. A fruit storage company has built new facilities in northern Berkeley County within the past 10 years and the Orr family has recently upgraded their apple packing line in their packinghouse located on Apple Pie Ridge in southern Berkeley County (Orrs 2010).

Virginia

The Virginia sub-region consists of four counties: Clarke, Frederick, Shenandoah, and Rockingham (Figure 3.7). Topographically, Frederick (VA) and Clarke (VA) counties share similarities with their neighbors, Berkeley (WV) and Jefferson (WV) counties, to the north. Like Jefferson County in West Virginia, Clarke Countyôs (VA) eastern sector is the Shenandoah River and the Blue Ridge. Most of Frederick (VA) and Clarke counties consist of the broad Shenandoah Valley while the mountainous Appalachian Ridge and Valley province picks up in Frederick Countyôs (VA) western sector. Farther south, the presence of Massanutten Mountain, a 40 mile-long ridge high enough to support a ski resort, narrows the Shenandoah Valley in Shenandoah County (VA) and the northern part of Rockingham County (VA). The Valley widens out again past Harrisonburg (VA) where the eastern boundary becomes the 4,000 foot high main range of the Blue Ridge (Figure 3.1). The two largest cities in the Virginia sub-region are Harrisonburg with a population of 48,914 and Winchester, population 26,203 (U.S. Census Bureau 2011). Both are independent cities and are politically separate from their surrounding counties.

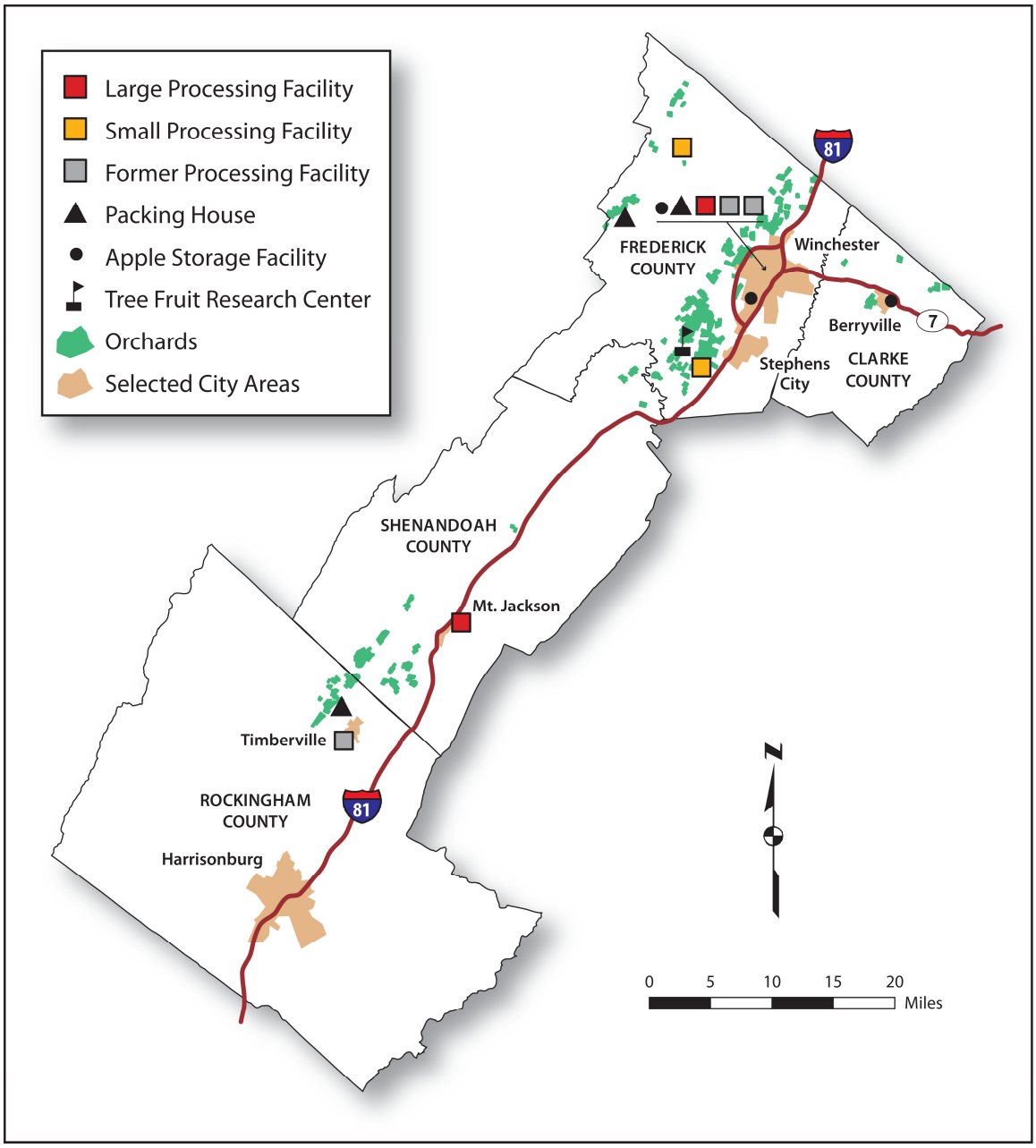


Figure 3.7 Map of the Virginia Sub-Region

Map by Will Fontanez and Joseph P. Guttmann

The Virginia sub-region had 8,939 acres in apples in 2007 accounting for 30.5 percent of the apple acreage in the Shenandoah-Cumberland Valley Fruit District (Table 3.6). With 5,600 acres, Frederick County (VA) ranks second in apple acreage in the Fruit District and fourteenth in the nation (Table 3.3) (USDA NASS 2009c). Two major concentrations of apple acreage are found in the Virginia sub-region. The vast majority of apple trees in Frederick County (VA) and northern Shenandoah County (VA) are located on Apple Pie Ridge and in the flatter areas west of Interstate 81 (Figure 3.7). The second major concentration stretches from the Timberville area of Rockingham County (VA), northward to an area west of Mt. Jackson in southern Shenandoah County (VA). There are also clusters of orchards in the Appalachian Ridge and Valley sector of western Frederick County (VA) and isolated orchards around Berryville, the county seat of Clarke County (VA).

Unlike some of the other sub-regions in the Shenandoah-Cumberland Valley Fruit District, other fruits are not grown in large quantities. The Virginia section of the Shenandoah Valley has only 228 acres in peaches, almost all located within Frederick County (VA) (Table 3.6). Receipts from raw fruit produced in the Virginia sub-region is $28.1 million or 27.3 percent of the value produced in the Shenandoah-Cumberland Valley Fruit District. Frederick County leads the sub-region with $16.1 million in raw fruit sales (Table 3.5).

Since 1982, apple acreage in the Virginia sub-region has declined by 43.9 percent with Frederick Countyôs (VA) decline being 35.9 percent (Table 3.3; Table 3.6). Frederick County actually posted modest gains up until 1992 and its apple acreage did

not start declining until after the 1997 Census of Agriculture (Table 3.3). Neighboring Clarke County (VA) has experienced the steepest decline, losing 84.2 percent of its acreage in apples. Despite starting from a much smaller base and the county's proactive attempt to protect the viability of its farm economy, Clarke has lost a greater number of apple acres than Frederick County (Coughlin, Keene & Associates 1997). Clarke County's decline started following 1987 and was especially steep following the 2002 Census of Agriculture when several large growers removed their orchards (Edwards 2004; Withers 2005; Mangino 2006b). The decline of acreage and production in the northern Shenandoah Valley can be partly attributed to a series of poor weather years compounded by the sub-region's high reliance on a processing market beset by poor returns in the 2000s (Edwards 2004; Withers 2005; Kane 2008).

The Virginia sub-region has a well-developed apple industry infrastructure. The area has two large processing facilities: National Fruit Product Company based in Winchester (VA) and Bowman Apple Products in the Shenandoah County town of Mt. Jackson (VA) (Figure 3.7). On a smaller scale, the Shawnee Canning Company produces apple cider and applesauce in addition to its main product, canned peaches, while Rinker's Orchard sells wholesale apple cider to grocery stores and farm markets. Both the Shawnee Canning Company and Rinker's Orchard are located in Frederick County (VA) (Rinker Orchards 2011; SSCC 2011). The sub-region has several packinghouses that supply the fresh wholesale market. The largest of the Virginia-based packinghouses, and the second largest in the Shenandoah-Cumberland Valley Fruit District, is Turkey Knob in Timberville (Rockingham County, VA). The Turkey Knob Growers is an

alliance of the Bowman family with several other local growers (Turkey Knob Apples 2009). The third largest packer in the Fruit District is Fred L. Glaize in Winchester (Glaize 2010a). Timber Ridge is a smaller operation with its packinghouse located on the farm in the Appalachian Ridge and Valley sector of western Frederick County (VA). Cold storage companies are another key support business for the Virginia apple industry. Winchester Cold Storage once boasted that it was the largest apple storage in the world. While it has since amended its ñWinchester Cold Storage Co, Largest Apple Storage in the Worldò sign with a ñone of theò in small print, the main facility still has a capacity to store well over a million bushels of apples in controlled atmosphere and regular cold storage. Another company, Virginia Storage, can store 500,000 bushels of apples at its Winchester facility (Vaden 2009).

One difference between Adams County (PA) and Frederick County (VA), the two counties with the most apple acreage in the Shenandoah-Cumberland Valley Fruit District, is the location of the non-orchard components of each countyôs apple industry. In Adams County, the processing facilities and packinghouses are located in the villages and towns of the South Mountain Fruit Belt. Places like Orrtanna (PA), Gardners (PA), and Peach Glen (PA) have large factories but small populations. The apple industry has very little presence in the countyôs largest city, Gettysburg (PA). In contrast to the decentralized nature of Adams County (PA), Frederick Countyôs (VA) apple infrastructure is concentrated in the city of Winchester (VA). North of downtown, the massive Winchester Cold Storage buildings, National Fruitôs processing facilities and corporate headquarters, the Fred L. Glaize packinghouse, the former Robinson Ice and

Cold Storage/Zeropak facility (a fruit storage and frozen apple slice factory), the former Shenandoah Apple, Cider, and Vinegar Company (a processing plant now used by National Fruit), an agricultural chemical company, and the Frederick County Growers Association's labor camp are all located next to each other in an agglomeration of apple-related businesses (Figure 3.8; Figure 3.9) (Edwards 2004; NFPC 2010).

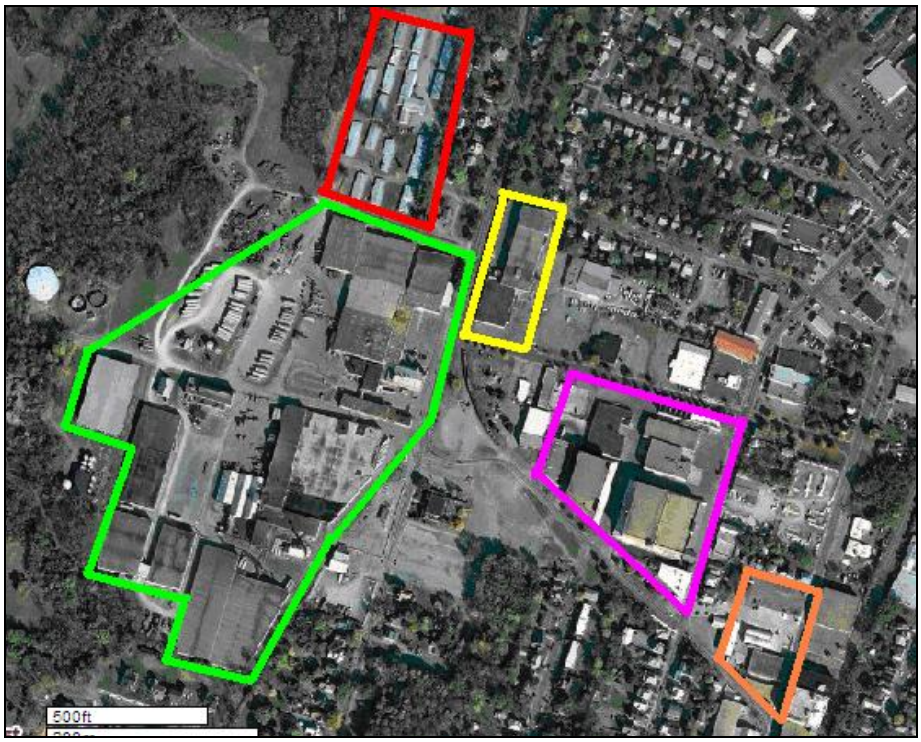


Figure 3.8 Aerial Map of the Winchester (VA) Apple Complex

Located a mile north of downtown Winchester is an agglomeration of apple industry support businesses *Green* ï National Fruit Product Company *Red* ï Frederick County Growers Association Migrant Labor Camp *Yellow* ï Fred L. Glaize packinghouse *Purple* ï Winchester Cold Storage *Orange* ï the former Robinson Ice and Cold Storage/Zeropak facility (a fruit storage and frozen apple slice factory which closed in 1998 Map taken from Mapquest.com

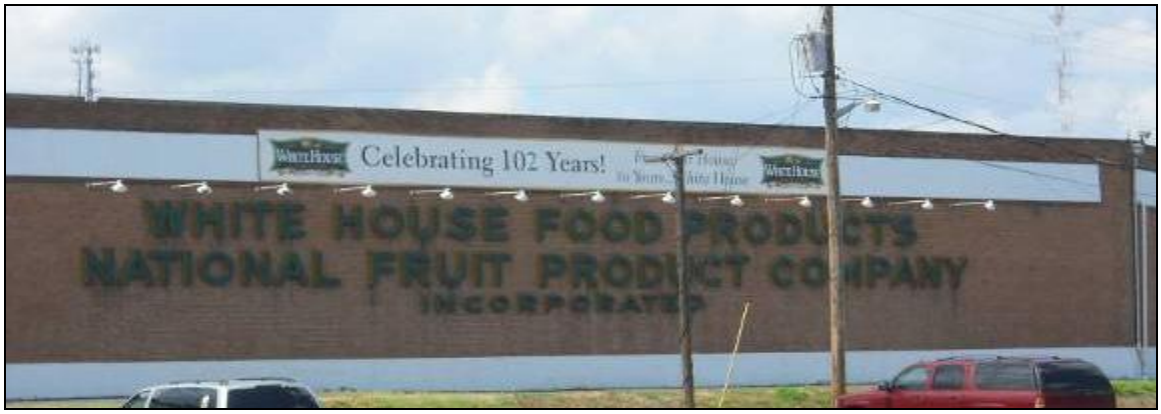


Figure 3.9 Winchester Apple Complex

National Fruit Product Company a large processor of applesauce, apple juice, cider vinegar, and other apple products; Winchester VA

Photograph by Joseph P. Guttmann







Figure 3.9 (continued)
Top ï The mammoth Winchester Cold Storage facility *Center* ï Fred L. Glaize packinghouse
Bottom ï Frederick County Growers Association Migrant Labor Camp; Winchester VA
Photographs by Joseph P. Guttmann

Cumberland Valley

The Cumberland Valley sub-region contains Cumberland County (PA), Franklin County (PA), Washington County (MD), and a small section of Frederick County (MD) (Figure 3.10). The sub-regionôs defining geographical feature, the Cumberland Valley, stretches in an 80 mile arc from the Susquehanna River to the Potomac River. Washington County (MD) and Franklin County (PA) also extend west into the Appalachian Ridge and Valley province (Figure 3.1). The most populous of the sub-regions, the Cumberland Valleyôs 532,454 people account for 47.6 percent of the Fruit Districtôs total population. Important cities include Hagerstown (population 39,662) in Washington County (MD) and Chambersburg (population 20,268) in Franklin County (PA). Carlisle (population 18,682) is Cumberland Countyôs (PA) largest city but the suburbs of the state capital, Harrisburg, form the largest population complex in the county (U.S. Census Bureau 2011).

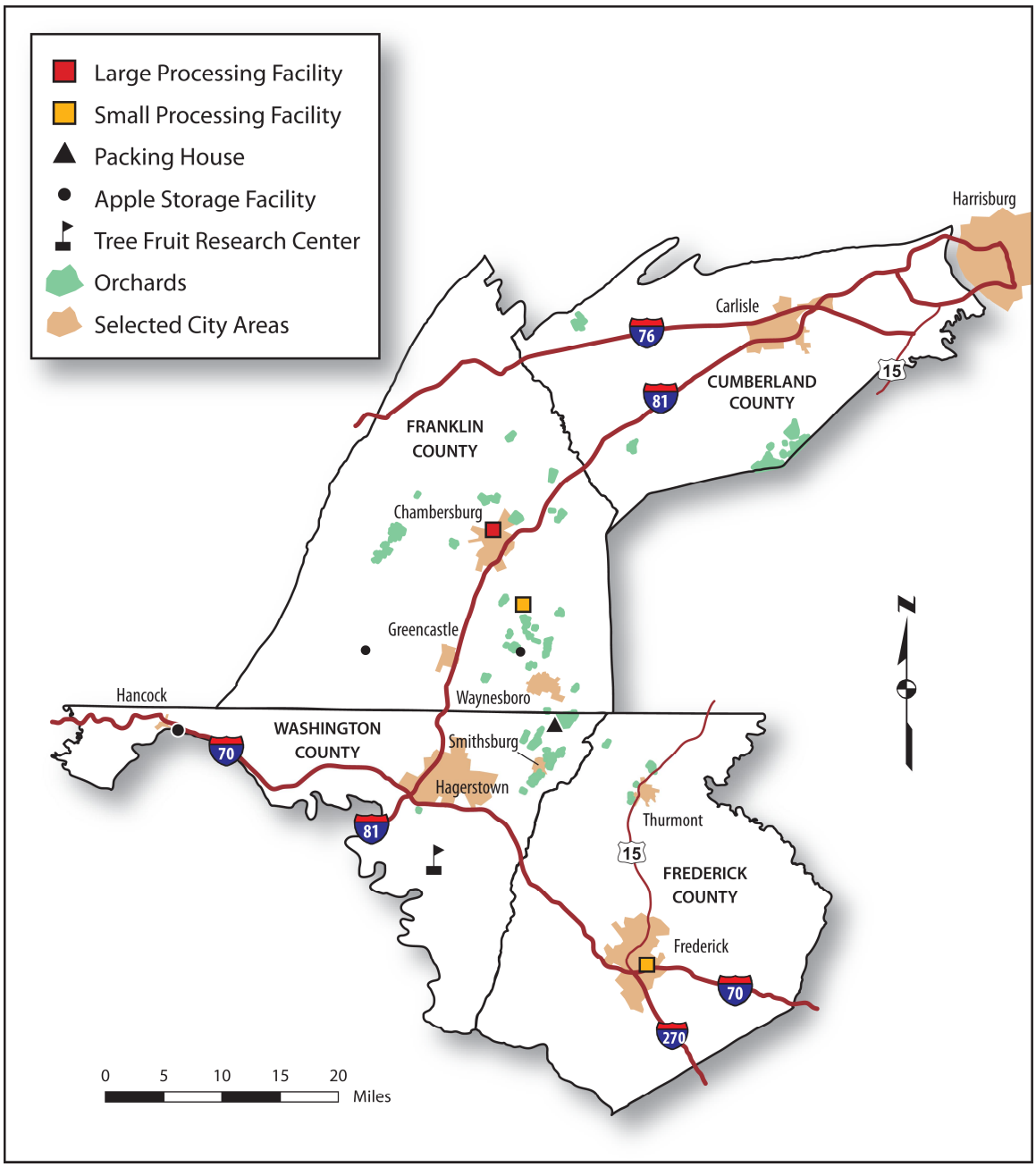


Figure 3.10 Map of the Cumberland Valley Sub-Region

Map by Will Fontanez and Joseph P. Guttmann

In 2007, there were 3,700 acres of apples in the Cumberland Valley accounting for 12.6 percent of the total apple acreage in the Shenandoah-Cumberland Valley (Table 3.6). Not included in this total was the estimated 50 acres from the Catoctin Mountain orchards in Frederick County (MD) that were included in the sub-regionôs survey results. The Cumberland Valley sub-region contains several small geographic concentrations of orchards. Historically, one of the oldest apple-producing areas is located in the ñNorth Mountain Fruit Beltò west of Chambersburg in Franklin County (PA) (Figure 3.10) (Nagurny 2002). Also in Franklin County (PA), a cluster of orchards is located midway between the cities of Chambersburg and Waynesboro. Spillover from Adams County (PA) near Peach Glen is responsible for the largest concentration of orchards in Cumberland County (PA). According to the 2008 Pennsylvania Orchard and Vineyard Survey, over one-half of the apple acreage located in Cumberland County is controlled by operations that are headquartered in Adams County (PA) (USDA NASS 2008). Outside of these clusters, the remaining apple acreage in Cumberland (PA) and Franklin (PA) counties consist of isolated orchard operations. The largest concentration of orchards in the Cumberland Valley sub-region is located around Smithsburg in Washington County (MD) (Figure 3.10). Containing almost all of the countyôs apple acreage, many of the Smithsburg area orchards are located at the base and lower slopes of South Mountain. On the other side of South Mountain is the Catoctin Mountain cluster near the town of Thurmont in Frederick County (MD). This area of orchards is approximately 15 miles north of the city of Frederick (MD) and 10 miles south of the Adams County (PA) line.

Since 1982, the Cumberland Valley sub-regionôs apple acreage has declined by 6,764 acres. This 64.6 percent drop in acreage is second only to the West Virginia sub-regionôs 73.7 percent decline (Table 3.6). Washington County (MD) experienced its greatest decline between the late 1970s and 1992, while Franklin County (PA) experienced a steady but steep decline in acreage since 1992 (Table 3.3). Many Cumberland Valley growers also produce fruit other than apples. With 848 acres, peaches are the most widely grown non-apple fruit in the Cumberland Valley (USDA NASS 2009b). In fact, peaches may have a higher profile in the Cumberland Valley than apples. Peaches from Franklin County (PA) and nearby areas are often marketed as ñChambersburgò peaches in western Pennsylvania. This place-based connotation has come to represent quality over the years in the Pittsburgh area (Freshplaza 2007; Sollenberger and Kammerer 2007; Fermata Inc. 2009). In addition to peaches, Franklin County (PA) has over 100 acres planted in tart cherries (USDA NASS 2008). The farm gate for apples, peaches, cherries, and other fruit grown in the Cumberland Valley was worth $16.6 million in 2007 (Table 3.6). Not included in this total were the proceeds from the more than 120 acres of non-apple fruit from the Catoctin Mountain orchards in Frederick County (MD).

Apple infrastructure is limited in the Cumberland Valley sub-region. Rinehart Orchards of Smithsburg (Washington County, MD) is the only fresh wholesale packer in the Cumberland Valley (Figure 3.10). Rinehartôs is typical of the small and medium-sized packers in the Fruit District in that the packing line and cold storage facilities are all located on the orchard site (Rinehart 2009). Also in the wholesale business, Keystone

Fruit Marketing of Franklin County (PA) serves as a national marketing agent and broker for Pennsylvania apples and other produce (KFM 2011). Knouse Foods operates an applesauce plant in Chambersburg (PA) (Knouse Foods 2010). On a much smaller scale, Country Acres of Franklin County (PA) presses apple cider that is marketed at Wal-Mart, Food Lion, and other grocery stores. Located just outside the Fruit District, McCutcheonôs Apple Products of Frederick (MD) is a medium-sized processor that makes cider, fruit preserves, and other food products that are sold nationally at farm stores and specialty stores (MCAP 2010).

CHAPTER 4: METHODS

This study examines apple grower decision-making in an area increasingly impacted by encroaching urban development. The results of these individual decisions are reflected in the landscape and help shape the region's sense of place. As discussed in Chapter Two, many potential underlying reasons contribute to the decline in apple acreage in the Shenandoah-Cumberland Valley Fruit District. Factors that influence growers to stop producing apples can be roughly divided into three geographic scales - the macro, regional, and farm-level. One way to determine the relative importance of these factors at the various scales is to ask current and former growers for their perspective on the topic. Input from growers was primarily elicited through a mail survey. Follow-up interviews with growers and those involved in the apple industry supplemented the information gained via the mail survey. Finally, additional insights were gained through personal observations and through attending industry-related events.

Survey Design

A mail survey was chosen as the primary means of reaching out to growers because it has several built-in advantages. Provided there is access to an address list or that such a list can be compiled, surveys can reach many people in a short period of time. Another advantage is that surveys can cover a broad range of topics, an important attribute given the number of potential factors that contribute to acreage decline in this study. For the survey participant, surveys are less time-consuming than an in-depth interview and they can complete them at their convenience. Survey results can also be

tabulated and presented as quantitative data in the form of descriptive statistics or be subjected to analysis using inferential statistics. Quantification makes it easier to make inferences based on geographic or other relevant criteria.

The mail survey was designed and administered with a few modifications in accordance with Dillmanôs (2007) ñTailored Design Method.ò The gold standard for 30 years, Dillmanôs structured approach to the design and implementation of surveys routinely produces response rates of 70 percent or higher for specialized populations. Using Dillmanôs (1978) methods in a similar survey, Zollinger and Krannich (2002) received a 66 percent response rate from Utah farmers. The goal of my study was to get within a few percentage points of that studyôs response rate. The ñTailored Method Designò is a comprehensive plan that details everything from the design of the questions and the physical layout of the survey to the timing of each mailing. Its success is based on the premise of social exchange and repeated contacts with the survey population (Dillman 1978, 2007). Social exchange is the concept that there are costs and rewards gained from each human interaction. Ways to increase the rewards while reducing social costs include: (1) making the respondentôs voice seem important; (2) avoiding inconveniences such as failing to provide for stamped return envelopes; and (3) creating an interesting yet easy-to-understand survey. The design aspects that inspire people to return a survey are reinforced by repeated contacts.

Dillman (2007) suggests that five contacts are to be made with potential respondents. First, a pre-notice letter is mailed a few days prior to the mailing of the actual survey. This gives those on the survey list a ñheads upò that a questionnaire will

be sent to them shortly and makes the mailing containing the survey seem less like a ñcold call.ò It also confirms correct addresses as undeliverable mail will be returned to sender. The second mailing consists of the actual survey and a cover letter explaining the purpose of the study. Because the greatest number of returned surveys are mailed back within a couple of days, the third mailing occurs one week later. This mailing takes the form of a thank you postcard but also serves as a reminder to those who have yet to return the original survey. Two-to-three weeks later, a replacement survey is remailed to non-respondents. Finally, Dillman suggests a final inquiry that encompasses a different mode of contact such as a special delivery.

Two issues must be discussed. First, besides the cycle of repeated contacts, the other method that has consistently been most important in raising response rates has been the inclusion of a token financial incentive (Dillman 2007). By including the token amount with the survey mailing, the goodwill gesture creates a sense of open-ended reciprocal obligation and implies a trust that they will respond. In a meta-analysis of 74 studies, inclusion of a token monetary incentive with the first mailing that includes the actual survey increased response rates by an average of 19.1 percent over control groups that did not include a monetary incentive (Church 1993). Promises of payment upon return of the survey did not increase response rates in a statistically significant manner (James and Bolstein 1992; Church 1993). For this study, no financial incentive was offered to the growers to return the survey because of budgetary constraints and the fact that financial incentives would not be expected from a graduate student.

The other issue concerns the mode of the survey. With the widespread access to the internet, web surveys have become an alternative to the mail survey. Web surveys offer substantial cost savings in terms of time and money. Dillman (2007) suggests that it is possible to create mixed mode studies, but that the questions must be equivalent. In a study that involved the Michigan State University campus population where both web survey and mail survey were compared, Kaplowitz *et al*. (2004) found that in general, the web survey had comparable response rates to the mail survey. The exception was that the mean age of web respondents was 24.1 years old while the mean age of mail respondents was 30.6 years old. A meta-analysis of 39 studies found a slightly different result with mail surveys having an average 10 percent higher response rate when compared to web surveys (Shih and Fan 2008). Taking into account this 10 percent response differential and the fact that the average age of the principal farm operator in America is 57.1 years old, I decided that the mail survey was the most appropriate method for this study (USDA NASS 2009b). Another obstacle that aided this decision was that e-mail addresses can be more difficult to obtain and can be more transient than residential mailing addresses.

The survey was designed to include input from both current and former growers. Knowing that obtaining addresses for former growers would be challenging, the expectation all along was that returns from current growers would dominate. Nevertheless, the inclusion of former growers in this survey assisted in the determination of which factors were important in the decision to actually stop growing apples. After all, the decision of former growers to stop growing apples has, in many cases, accelerated the decline in apple acreage and has led to changes in the landscape. The perceptions and

actions of former growers could also then be compared to those of current growers. The inclusion of former growers in the survey proved to be tricky as it initially led to some awkward question phraseology. This problem was solved by having the first question ask if the survey participant produced apples in 2009. Those that answered ñNoò were classified as former growers. To create a more natural flow to the questions, former growers were then asked to answer the rest of the questions in the survey based on the last few years they were still in operation.

The actual surveys were printed in attractive twelve-page, 5 ½ò x 8 ½ò booklets (see Appendix One). The University of Tennessee Graphic Design Service assisted with the layout design and printed the survey and envelopes. The cover page consists of the title ñMid-Atlantic Apple Survey: A Survey for Current and Former Apple Growers,ò a color photo of a ripe apple hanging from a tree, and a logo from the University of Tennessee, Knoxville. The inside front cover, back cover, and inside back covers were left blank. The survey questions were vetted by two people close to the industry and three people associated with the University of Tennessee.

The survey is divided into three sections. The first section focuses on the status of the growerôs current farm. This includes how many acres the grower has in apples and other crops as well as the percentages of the apple crop that he or she sells on the fresh wholesale market, directly to consumers, or to processors. The second section is the perceptual part of the survey and asks the growers to rate the importance of potential factors that may influence their decision to stop growing apples. It also examines the impact of development pressure and their expectations of future land-use patterns in the

event they sold their land. The final section deals with any operational changes growers have made to their farming operation in the past 15 years or expect to make in the next five years. This includes technological adaptations and shifts in market outlets for their produce. The 15 year threshold was chosen because the Shenandoah-Cumberland Fruit District had been experiencing rapid population growth during this time. It also marks the beginning of the importation of Chinese apple juice concentrate into the market, an important milestone for an area so dependent on processor apples. The five-year threshold was used at the suggestion of Lockeretz *et al*. (1987) in their study of farmers in the Worcester, Massachusetts area. The authors felt that farmers only plan ahead about five years and that plans beyond that time frame are increasingly vague.

An explanation of how a survey respondentôs privacy would be protected was included in the cover letter. Growers were assured that their answers would remain confidential and only be released as summaries so that no individualôs answers could be identified. A handwritten number was included on the back of the survey to track who had returned the survey. The number was necessary to know to which growers to send thank you notes and who needed to be sent a second survey. The ability to link names with answers also aided in tailoring specific questions to the growers who were later interviewed. Many respondents took advantage of a space for additional comments that was made available at the end of the survey. Pertinent comments taken from this section and used in this dissertation will be credited as an anonymous source to maintain the privacy of the respondent.

Survey Implementation

The first step taken towards implementing the survey was building an address list of area growers. This was a time-consuming process as no master list is available to the general public. Addresses of current growers who received some form of federal payment in the past were obtained through a Freedom of Information Act request made through the United States Department of Agriculture. Of the 241 addresses from the states of Pennsylvania, Maryland, West Virginia, and Virginia that were provided by the Farm Service Agency, 78 were located in the counties of study. Letters requesting grower addresses were sent to the various state apple associations. Only the Virginia State Horticultural Society provided a membership list with addresses as the other state associations either ignored or declined the request citing privacy issues. The lists provided by the Farm Service Agency and the Virginia State Horticultural Society were supplemented by grower addresses found on various websites in the public domain. These websites include the departments of agriculture from Virginia, West Virginia, and Maryland, Penn Stateôs agriculture extension service, a pick-your-own site, and Allaboutapples.com, a site with orchard listings by state. One helpful site was the Farm Subsidy Database run by the Environmental Working Group, a non-profit research and advocacy organization. This site lists all the federal subsidies received by each farmer over the past 10 years. While apple growers normally do not receive many federal payments, subsidies were provided during the years 2001ï 2003 under the Apple Market Loss Assistance Program. Both the names of growers and scale of their operation (determined by how much subsidy each received) were obtained from this database.

Addresses of farmers were not available from the Farm Subsidy Database, but many could be found once the grower or orchard name was identified by using the White Pages or the Google internet search engine (EWG 2010).

Surveys were mailed out to 240 current and former growers, but that number eventually reduced down to 219 because some faulty addresses could not be rectified. Likewise, some of the growers had passed away and some had never been apple growers. The non-growers included three persons from the Virginia State Horticultural Society who were associated with the apple industry but were not growers and two addresses from the USDA list who were farmers, but not apple growers. All five were kind enough to inform me of their status. So, it is possible that a few other non-apple growers ended up on the final list but were not culled because of their non-response. The breakdown of the 219 valid addresses on the list includes 118 from Pennsylvania, 19 from Maryland, 42 from West Virginia, and 40 from Virginia.

When conducting a survey, the operator has the choice of surveying the total population of qualifying respondents or surveying a sample of the total population. Had this been a survey of all farmers in the Shenandoah-Cumberland Fruit District, the number of farmers in the total population set would have been too large and a sample would have been more appropriate and cost effective. Given the more limited number of apple growers in the region, a survey of the total population was feasible and preferable. Whether the grower had a few acres or hundreds of acres, I felt that every growerôs opinion was important and should be heard if they elected to participate in the study.

Two potential errors can occur when doing a survey. Coverage errors occur when eligible respondents are omitted from the list of potential people surveyed (Lohr 1999; Dillman 2007). This study has some built-in coverage error as not all growers were on the address list. For example, after conducting some interviews in Hampshire County, West Virginia, I realized that I had only mailed surveys to seven out of the ten growers in the county. Addresses of growers who only produced for the processing market were particularly difficult to obtain. With no need to advertise to the general public, many processing growers do not have a web presence. Obtaining former grower addresses likewise proved difficult. A few former growers were included because they had left the business after the addresses on the various websites were last updated. Other growers had stopped growing apples after their names were listed on the Farm Subsidy Database and their addresses were found on the White Pages website. Considering the challenges in building the address list, the level of coverage error was low. For example, according to the Pennsylvania Orchard and Vineyard Statistics 2008, 126 current commercial apple growers operate in Adams, Franklin, and Cumberland counties. Not counting the six former growers who returned surveys, my survey had the potential to reach 112 of the 126 growers in the state survey (USDA NASS 2008). Likewise, I obtained addresses for 32 out of the 37 growers in Virginiaôs Frederick, Clarke, and Shenandoah counties listed in the 2005 Virginia Orchard Survey and a few growers in the stateôs survey were double counted if the grower had operations in more than one county (USDA NASS 2005).

Another problem, non-response error, occurs when the respondents to a survey differ from non-respondents in a significant way that affects the interpretation of the

study. For example, if small-acreage growers are responding at a rate significantly lower than large-acreage growers, this could be problematic. High response rates *per se* do not define the success of a survey. The most important aspect of the survey is that the responses are representative of the group intended to be surveyed (Lohr 1999; Dillman 2007).

When surveying agriculturalists, the timing of the mailings will have an impact on the response rate. One local grower said that he would most likely fill out a survey if he was not busy but would probably throw the survey in the trash if it arrived at a hectic point in the season. Heeding his advice, it was necessary to avoid the peach and apple harvest seasons. Peach season starts in early July and late varieties of apples do not get picked until November. Holiday seasons are another time period to avoid mailing surveys (Dillman 2007). For orchardists, January is a down period and is often their time to take vacations. In fact, several surveys were returned with Florida postmarks.

The pre-notice letter was mailed on December 28, 2009. It was written to pique the growersô interest and to let them know that a survey would be soon arriving (see Appendix Two). It also allowed me to fix a few incorrect addresses before the more expensive survey packet was mailed. The survey packets were mailed to 223 addresses on January 13, 2010. The survey packets consisted of a cover letter, the survey booklet, and a return envelope with first-class postage stamps. I was told that growers tend to receive a lot of surveys so the cover letter had to sell them on the reason why they should want to complete and return this particular survey. Using the University of Tennessee letterhead, the cover letter explained the purpose of the study, how I obtained their

address, how their responses would be used, and covered privacy issues (see Appendix Three). It also highlighted my local roots, important because the University of Tennessee is decidedly non-local. Return envelopes were addressed to my post office box in Hedgesville, West Virginia.

Reminder postcards were mailed out on February 1st. By that time, 90 surveys had been returned for a 41.1 percent response rate. The reminder postcards were mailed out to addresses that had not yet responded. Handwritten thank you notes were mailed out the following week (see Appendix Four). The notes are not a recommendation of Dillmanôs (2007) ñTailored Design Methodò but were sent out as a small token of my gratitude for them sending back the survey. Even those who returned a blank survey or a notification that the grower was deceased were sent a thank you note. The standard response was ñThank you for taking the time to fill out and return the survey about the local apple industry. I appreciate your help.ò I tried to personalize the note more if the grower had added comments or if I had had some contact with them in some way. One challenge to the pacing of the mailings came in early February with the arrival of two major snowstorms. The snowstorms, which left over three feet of snowpack on the ground within a weekôs time, stopped the mail for a few days. Mail boxes had to be dug out if people were to receive mail.

Final surveys were mailed on February 2nd. By this time, 114 surveys had been returned for a 52.1 percent return rate. In addition to resending surveys to previous non-respondents, 17 new addresses were added to the mailing list. Three of the 17 addresses were current and former growers from the Hedgesville area, orchards that I drove past

everyday but for whom I previously did not have a mailing address. Four new addresses were from a USDA online audit list of those participating in the voluntary Good Agricultural Practices & Good Handling Practices program. The decision to include the four addresses from the Catoctin area of Frederick County, Maryland also occurred at this time. The remaining addresses were added from rechecking the Farm Subsidy Database (EWG 2010). This mailing included a new cover letter for the previous non-respondents (see Appendix Five). The fifth ñspecial deliveryò mailing suggested by Dillman (2007) was not used because the response rate was sufficient and the few percent that might have been gained did not justify the additional expenses required. I also felt that another mailing could have been interpreted as ñnagging.ò I did end up interviewing a few growers who were initially non-respondents.

By the end of the survey period, 150 usable surveys were returned for a 68.5 percent response rate. Of the four geographical sub-regions, growers from West Virginia returned 34 surveys and had the highest response rates at 81 percent (Table 4.1). This was not surprising given that the cover letter accompanying the survey emphasized my local roots by mentioning that I had attended Hedgesville High School and the return envelope had a West Virginia address. Although Adams County, Pennsylvania had the lowest response rate at 63.6 percent, it had the highest number of returned surveys. The 63 surveys from Adams County accounted for 42 percent of the studyôs total returned surveys. Rounding out the sub-regions, Virginians sent back 26 surveys for a 65 percent response rate while growers from the Cumberland Valley sub-region returned 27 surveys for a 71.1 percent response rate.

Table 4.1 Survey Response Rates by State

State	Response Rate	Number of Usable Surveys Returned
Pennsylvania	65.3%	77
Maryland	68.4%	13
West Virginia	81.0%	34
Virginia	65.0%	26
Overall	**68.5%**	**150**

Source: Authorôs Mid-Atlantic Apple Survey

Five surveys were returned completely blank or asked not to be included in the survey. These were counted as non-responses, the same as if the survey had not been returned. Eight surveys, or 3.7 percent, were what I would classify as "minimal" responders. The surveys were mostly incomplete but some information was gleaned from notes or a few questions that were filled out. These "minimals" were counted towards the overall response rate and the data provided were included in the subsequent calculations. Data from the surveys were entered into an Excel spreadsheet and later transferred into a format compatible for processing using the Statistical Package for the Social Sciences (SPSS). The primary intended usage of these data was to generate descriptive statistics such as medians and percentages that would aid in the explanations of the changes occurring in the Fruit District.

As an outreach to those who participated in the survey and those interested in the topic, I constructed a website to present the results of the survey (see Appendix Six). The web address to the site was included in all correspondence. The title of the website ñGuttmann Apple Surveyò was chosen before I changed the name on the booklet to

ñMid-Atlantic Apple Survey.ò The website included a section ñAbout Meò and a section ñAbout the Study.ò These two sections were designed to reassure and convince the growers to complete the survey. Once again, my local roots were highlighted. These sections included how I got interested in this particular topic, how the topic relates to geography, explains the purpose of the study, and what steps I would be taking after the survey is completed. It also included a statement of objectivity which read:

> ñWhile we are not dealing with extremely controversial issues here, I will still strive to be as objective in my analysis as possible. I have no political or hidden agendas. I am not receiving any outside funding so I am not beholden to any agencies or foundations either. I picked this topic because I think it is interesting, relevant, and it has kept me motivated for the several years that I have already worked on it. I do enjoy driving past the orchards in my area and I think the apple industry is an important part of our regional identity. But, I do not have an economic stake in the industry and I would not begrudge landowners the right to use or sell land as they please (within existing county land laws, of course).ò

By February 1, 2010, I had posted the preliminary results of the survey. I did not post any opinion-based answers such as rating the importance of something until the survey was closed as I did not want to bias future respondents. After the survey was over, all the results of the survey were posted. The overall results were posted as well as a comparison of growers with over 200 acres of apples versus smaller scale operations. Results were also separated by geographical sub-region and then compared side-by-side. A photo journal of my observations highlighting the Fruit Districtôs apple industryôs infrastructure, its impact on regional identity, and how national apple industry trends are exhibited at the regional-scale rounded out the website (http://sites.google.com/site/guttmannapplesurvey/).

Interviews

A survey is good way to gain opinions from many people but has inherent limitations as to the depth of the information obtained. Qualitative methods such as semi-structured interviews can provide richer detail and a fuller understanding of the study questions (Bernard 1994). As follow-up to the survey, answers to interview questions can corroborate and give fuller explanations to the results. Interviews also can bring to light issues missed or not fully covered by the survey. In addition, interviews are another way of gathering background information about a topic. Because I do not come from a farming background, things that would be common knowledge for someone close to the apple industry were new to me and had to be explained. Thus, my positionality as an ñoutsiderò may cause the grower to reflect upon and verbalize the rationale for taken-for-granted protocols and procedures (Rose 1997).

Most of the interviews occurred in the late spring and summer of 2010. By waiting until after the surveys were completed and tallied, I was able to ask several questions that were specific to the results of the survey. People interviewed included growers and those associated with the apple industry. Those interviewed who are associated with the apple industry, its ñknowledge community,ò include county extension agents, USDA and federal researchers, packers, and processors. Some interviewees have dual roles such as being both growers and packers. Those who were interviewed were chosen for a variety of reasons. A couple of growers had left their phone number in the comment section of the survey. I also called a couple of growers who had written interesting comments. I found a few participants because they had been previously

quoted in newspaper articles. Finally, the most common method to find an interview was through the referral of another person (i.e., a ñsnowballò sampling design).

Nineteen interviews were conducted including 11 growers. An Informed Consent Form was given to the participants that detailed their rights and the nature of the study (see Appendix Seven). A few participants opted not to have their name associated with this study. Their input, and anything else that may be deemed controversial, were given ñanonymousò citations. The interviews lasted between one-half hour and three hours. Several growers even gave me tours of their orchards. Following the semi-structured interviewing approach, I had a list of topics and questions that I wanted to cover that were tailored to each participantôs situation. This differs from the structured interview approach in which all participants are asked the same questions. The semi-structured approach also allows for a certain amount of interviewer discretion to follow leads and adjust questions according to the flow of the interview (Bernard 1994). While some interviews relied on hand notes, most interviews were recorded with a digital audio recorder. I transcribed these latter interviews into hard copies for easier use.

Participatory Events

Observation is one of the most important tools of a geographer. A keen eye allows one to look at the spatial variations, similarities, and patterns that are at the heart of the discipline. In fact, this study began with an observation of the loss of apple acreage occurring in the area that was then corroborated by statistical evidence. Driving through the region, one can see where the orchards are located and which areas seem to be experiencing higher development pressures. One can also compare the relative

concentration of orchards in one area with other parts of the Fruit District where the orchards may be more dispersed. By looking at the orchards, one notices things such as the orchardôs general upkeep, cultural methods employed such as trellising, and whether or not recent plantings have taken place. Observation is also important in understanding how the fruit industry contributes to the overall identity of the region. For example, the apple iconography on water towers in several counties along Interstate 81 is one way the area chooses to represent itself to those coming from outside the region.

In addition to the passive observations, I also took a more participatory role in the research. For example, I attended a field trip with the Young Growers Alliance to the USDA Appalachian Fruit Research Center in Kearneysville, West Virginia. Our group toured the facility and learned about the latest research dealing with carbon sequestration in the orchard, apple genes that determine rootstock sizes, and the effects of certain pesticides on eradicating the brown marmorated stink bug. The field trip concluded at Orrôs, an operation with nearly a thousand acres of fruit and other produce located in Berkeley County, West Virginia. The young growers and I toured the orchard, the farm market, and the packinghouse while the Orr family explained how they have been using agritourist attractions to diversify their revenue streams. It was actually my second tour of the Orrôs orchard as my family and I had taken one of their twilight tours and picnics earlier in the month.

Another research showcase that I attended was the Peach Open House held at the Penn State Fruit Research and Extension Center in Biglerville (Adams County, PA). While the event was mostly focused on peaches, demonstration ñtest drivesò were

showcased of the self-propelled robot being developed by Carnegie Mellon as part of the Specialty Crop Innovation program. The event ended with an emergency educational meeting on the life cycle of the brown marmorated stink bug which was just starting to show more pronounced damage in Pennsylvania orchards.

Not all experiments take place at the research stations. In June 2010, I was invited to attend a twilight meeting for fruit growers held in Hampshire County, West Virginia. A twilight meeting is a gathering of growers at which an extension agent may go over the latest research and the growers can socialize and exchange ideas. In exchange for their attendance, the growers earn points towards their pesticide certification (Source 3199 2010). After a chicken dinner held at Shanholtz Orchards, we were taken out to some test plots where researchers were measuring the effects of orchard cover crops on weed control as well as the effects of a new herbicide.

In addition to the educational events, I attended several farmersô markets and festivals. Many growers from the area sell their produce both in the local cities and in the cities and suburbs of Washington, D.C., Baltimore, and Philadelphia. I went to a small farmersô market in Winchester and a larger one in Washington, D.C. Three growers from the Shenandoah-Cumberland Fruit District had set up their wares at a farmers market two blocks from the White House. While I have been attending the Berkeley Springs Apple Butter Festival for years, for this study I went to the National Apple Harvest Festival near Gettysburg, Pennsylvania, and the smaller Mountain State Apple Harvest Festival in Martinsburg, West Virginia. The only major apple-themed community festival that I did not attend was the Apple Blossom Festival in Winchester, Virginia. Although not

specifically apple-themed, I did attend the Pennsylvania Farm Show held in Harrisburg. It is essentially an indoor state fair held in January. Pennsylvaniaôs apple industry was well represented with an apple display by the Adams County Fruit Growers Association, a food stand run by the State Horticultural Association of Pennsylvania, and a processing display by Knouse Foods. On a more somber note, I also attended the final equipment auction for an orchard that went out of business. Most of the former orchard land is now two housing developments. By attending these events, I witnessed some of the current research being undertaken to improve the efficiency of the industry while gaining a fuller understanding of the workings of the apple industry and the role the apple industry plays in the larger community.

CHAPTER 5: MACRO-SCALE ISSUES IN THE APPLE INDUSTRY

Chapter Five examines the macro-scale issues that impact the U.S. apple industry. The chapter begins with a look at the yearly responsibilities of a typical grower and the costs incurred to operate an orchard. The quest to increase profits through production efficiencies and marketing is covered in the next section. This section also examines how the Shenandoah-Cumberland Valley Fruit District is responding, or not responding, to the major trends occurring in the apple industry. Descriptions of the other major apple-growing districts in the United States are included in Chapter Five because the total supply of apples, where and how the apples are marketed, and the prices received for apples are all related to the market position of the Shenandoah-Cumberland Valley Fruit District *vis-à-vis* the other apple-growing regions. After the impact of foreign trade is assessed, the main sources of competition for Fruit District growers and packers are discussed. Chapter Five concludes with a description of the roles non-local government policy and trade associations play in the apple industry.

A Year in the Life of an Apple Orchard

As the days get shorter and the weather grows colder, apple trees enter a state of dormancy that will last through the winter months. Most of the pruning is done while the apple trees are dormant. Apple trees need to be pruned to shape and maintain the treeôs framework and to increase light penetration to enhance fruit size and quality (Crassweller *et al.* 2005). Most trees require pruning on an annual basis although some of the large trees are pruned in alternating years (Marini 2010; Miller 2010). The replanting of trees

is usually done in the spring (Marini 2009). Most growers obtain their trees through a nursery that specializes in growing commercial fruit trees. To produce fruit with the consistent characteristics desired by growers and consumers, nurseries must graft or bud the desired variety onto a rootstock. The rootstock determines the relative size of the tree but does not affect the fruit quality (Parker 1993). Nurseries are also important purveyors of information to growers as they have to be up-to-date on all newly available varieties and manners of tree training. Depending on the rootstock, new trees take from two-to-five years to produce apples and a few more years after that to come into full production. Apple trees can remain productive for 25 years or more but the lifespan of an orchard is often dictated by market demand (O'Rourke 1994; Schotzko 2004; Marini 2010).

Once the apple trees have blossomed, they need to be pollinated by honeybees and other insects. Apples do not self-pollinate and need two and sometimes three varieties that have overlapping bloom periods within 100 feet of each other to get the job done (Crassweller *et al.* 2005; Marini 2009; Lynch 2010). Another concern in early spring is frost protection. Frost pockets occur in low-lying areas where cold air collects and stagnates. In the past, oil smudge pots and the burning of tires were common antidotes but have fallen out of favor because of environmental concerns. Wind machines are now used to mix the air to prevent frost (Cotrill 1993; O'Rourke 1994; Domoto 2006). In the Shenandoah-Cumberland Valley Fruit District, nature dictates that these wind machines are more commonly seen in the Shenandoah Valley section of the West Virginia sub-region than in the South Mountain Fruit Belt of Adams County, Pennsylvania (Figure 5.1).



Figure 5.1 Orchard Wind Machine

Typical orchard wind machine used to prevent frost in low-lying areas; Berkeley Co. WV
Photograph by Joseph P. Guttmann

After the fruit is set, thinning is required to reduce the number of apples per tree. Thinning reduces the competition for the treeôs resources, promoting larger, marketable fruit sizes for the remaining apples. Apple trees are prone to an alternate bearing pattern from year to year with its fruit load. Apples will naturally produce a heavy crop one year followed by a below average crop the next year. Thinning is the only way to ensure consistent moderate fruit loads that are more profitable in the long-run for the grower. Most thinning is done with chemical sprays but further hand thinning may be necessary (Thompson 1993; Nagurny 2002; Crassweller *et al.* 2005; Boland *et al.* 2007; Marini 2009; Schupp 2011). Other chores throughout the spring and summer months include mowing the orchard and providing weed control with herbicides.

The prevention of disease and pest damage to the trees and fruit is another ongoing task for growers during the growing season. Diseases and pests such as apple scab, fire blight, powdery mildew, and the codling moth can cause major financial losses. Historically, growers combated these threats with rather indiscriminate sprayings of various pesticides including lead arsenate and DDT (Folger and Thomson 1921; Hogmire 1993; Sonnenfeld *et al.* 1998; Hull and Krawczyk 2011). Today, most growers use an integrated pest management (IPM) program. By using natural predators to control mites and pheromones that disrupt insect mating, IPM seeks to limit the usage of pesticides in the orchard. Growers monitor insect traps and establish action thresholds in order to spray only at the optimal times. Reducing the amount of chemicals in the orchard is not only an environmentally friendlier approach than previous spray regimes but can potentially lower spray costs and reduce the likelihood that pests will develop a resistance to the pesticides (O'Rourke 1994; EPA 2010; Krawczyk 2010; WAC 2010c). The downside is that managing an IPM program requires more knowledge and is time-intensive.

Harvest is the busiest time of the year for growers. Growers have to hire and train a picking crew to do a fast, efficient job without damaging the fruit. If a grower offers on-site migrant housing, then the grower will also have maintenance duties similar to other landlords. The harvest season runs from mid-August to early November but each variety has a smaller window in which it needs to be picked. Once picked, it takes good organizational skills to get the fruit from the orchard to its market outlet in the least amount of time possible in order to prevent deterioration of the fruit. Many apple

processors and packinghouses employ fruit advisors who offer technical assistance to help growers maintain proper food safety procedures, determine harvest times, and navigate other issues prior to receiving the fruit at the plants (O'Rourke 1994).

Apples are perishable but advancements in storage technology have enabled apples to be sold year-round. If not immediately processed, apples received at the packinghouse or processor are placed in regular cold storage or controlled atmosphere (CA) storage. In regular cold storage, the apples are stored in a refrigerated room for up to four months. In controlled atmosphere storage, oxygen is removed from the air of sealed, refrigerated rooms which drastically slows down the natural ripening process. This process enables apples to be stored for up to a year without a noticeable loss in crispness (Dalrymple 1969; U.S. Apple Association 2001; Nagurny 2002; Crassweller *et al.* 2005; WAC 2010b).

Over the course of the year, growers face a wide array of fixed and variable costs. Fixed costs do not vary by the level of production and occur even if the grower does not produce a crop that season (O'Rourke 1994; Krawczyk 2010). Fixed costs include property taxes, insurance, and depreciation of farm equipment and buildings. It is expensive to establish a new block of trees so those costs are written off over the lifetime of the orchard as well. Costs incurred as a result of annual production are known as variable costs. Labor is usually the largest variable cost (O'Rourke 1994; Crassweller *et al*. 2005; Harper 2010). Depending on the size of the operation, growers rely on family members or a core of permanent hired labor for orchard maintenance and supervisory positions. Seasonal labor is used for harvesting and, to a lesser extent, for pruning and

hand thinning (Miller 2010). The next highest cost is for pesticide and herbicide sprays. Because orchards located in humid climates require more chemical applications, they incur higher spray costs than orchards in dry climates (O'Rourke 1994). Other orchard costs include fertilizers, bee hive rental, and fees for soil sample tests or other professional advice. Additional costs are associated with irrigation or the maintenance of migrant housing if either is used on the farm. Diesel fuel for tractors, pickups, and sprayers is a significant cost as is the price for their repair and upkeep. Growers may need to hire a trucking firm to haul the apples from the orchard to the market destination. Finally, growers may need to advertise if they maintain an on-the-farm retail operation.

Growers have three basic outlets for their apples: fresh market wholesale, a processing facility, or direct market retail. Apples sold on the fresh market earn higher returns than processing apples but also incur higher costs of production. Fresh market apples require more intensive care because they must taste good and be cosmetically attractive to potential buyers (Perez and Pollack 2003). This requires a higher use of sprays, an increased likelihood of hand thinning, and more careful handling at harvest time (Wenk 2010). The decision as to where a grower intends to market his or her apples is generally made when the trees are planted or, at the very least, prior to the beginning of the season (Harper 2010). The intended market destination will determine the amount of variable inputs invested into each orchard block. The actual percentage of apples sent to each market sector will then depend on the quality and quantity of the growerôs crop in relation to the overall market situation. In 2009, 66 percent of the total U.S.-grown apple

crop was sold on the fresh market while the remainder was processed into food products (USDA ERS 2010a).

Trends in the U.S. Apple Industry

By their very nature, variable costs in the orchard are prone to fluctuations. Before the recent economic downturn, the price of fuel, labor, and other inputs had been rapidly rising (Ford 2008; Sparks *et al.* 2008). If the prices received for their apples do not also increase, as is often the case, then growers experience a cost-price squeeze (Che 2006). Profit margins decline and growers must expand their production acreage, cut costs, or increase their output per acre to maintain their same levels of income (White 2000; Warner 2010b).

Higher Tree Densities

One way to handle the cost-price squeeze is through producing more apples per acre and lowering per unit costs. To enact these changes, many growers are increasing the number of trees per acre and changing the layout design of the orchard block. In the middle of the 20th century, a typical acre would consist of 40 trees with 40ô x 40ô spacing (Blizzard 1993). With advances in rootstocks, todayôs orchard blocks can have densities over 1,000 trees per acre and occasionally reach up to 2,200 trees per acre (Robinson *et al.* 2007).

Rootstocks can be roughly divided along a continuum into standard, semi-dwarf, and dwarf sizes (Figure 5.2). Traditional standard trees can grow to over 30 feet in height and produce for 40 years or more. The trees are hardy and drought tolerant. Their large

size necessitates using heavy ladders for pruning and harvesting, increasing labor costs (Blizzard 1993). Relatively few standard trees are still planted and more than two-thirds are 25 years old or older (USDA NASS 2004, 2005). Semi-dwarf trees are typically planted in densities of 120 to 300 trees per acre. They range from 14 to 22 feet in height and need about 12 feet of spacing in between each tree in the row. Semi-dwarf trees produce apples four-to-five years after planting and reach full production in eight-to-nine years (Blank 1998; Bennett 2004; Robinson *et al*. 2007; Lehnert 2010c; Marini 2010).

The movement over the past 30 years has been towards high-density plantings on dwarf rootstocks. Densities for dwarf trees range from 400 to 2,200 trees per acre. Trees grow from six to 12 feet in height and spacing usually ranges from two to seven feet (Robinson 2005; Robinson *et al*. 2007). Unlike semi-dwarfs, dwarf trees need to be supported by individual stakes or a wire trellis system (Figure 5.2) (Crassweller *et al*. 2005). The need for tree support, an irrigation system, and the cost per tree from the nursery makes the initial investment in a high-density orchard quite expensive. Whereas it costs $2,000-$3,000 an acre to establish a block of semi-dwarf trees, an acre on dwarf rootstock will cost between $7,000 and $15,000 depending on the system chosen (Lehnert 2010c; Marini 2010; Harsh 2011).







Figure 5.2 Examples of Tree Rootstocks and Planted Densities

Top - Large, standard tree with thick trunk; Berkeley Co. WV; *Center* - Typical appearance of an orchard in the Shenandoah-Cumberland Valley Fruit District, semi-dwarf trees; Clarke Co. VA; *Bottom* - Close-up of high-density orchard using dwarf trees and wire trellis; Adams Co. PA

Photographs by Joseph P. Guttmann

High-density systems that use dwarf rootstocks are easier to spray and harvest, start producing a crop as soon as the second year, and have a higher overall yield (Baugher 2010; Lehnert 2010c; Lynch 2010; Marini 2010). For a grower, receiving high early returns is critical in limiting the time of negative cash flow that occurs before an orchard blockôs annual receipts surpass its annual costs (Harsh 2011). Additionally, trees with smaller canopies intercept sunlight better, improving overall fruit quality (Baugher 2010; Lynch 2010; Schupp *et al*. 2011). In one study conducted in Michigan, the high-density, tall spindle trellis system planted at 1,200 trees per acre reached its maximum production of 1,000 bushels per acre in year five while the stand-alone semi-dwarf trees planted at 202 trees per acre attained 700 bushels in year nine. After 20 years, the tall spindle trellis system utilizing dwarf rootstocks generated over three times the cumulative profit per acre than did the stand-alone semi-dwarf block of trees (Lehnert 2010c).

Some apple-growing regions in the United States have higher average tree densities than other growing regions. For example in 2006, the state of Washington had an average of 434 trees per acre compared to New Yorkôs average of 223 trees per acre. Washington has since increased its average tree densities to 562 trees per acre (USDA NASS 2006, 2007b; 2011). One result of planting higher densities is a higher average yield per acre of land. Washington leads the nation with an average of 35,400 pounds produced per acre (Table 5.1).

Table 5.1 Average Apple Yield per Acre 2007–2009, Select States

State	Average Yield Per Acre 2007-2009 (lbs.)
Washington	35,400
New York	31,433
Michigan	22,533
Pennsylvania	22,633
Virginia	19,167
West Virginia	16,567

Source: USDA, NASS *Noncitrus Fruits and Nuts 2009 Summary*

Average tree densities and average yield per acre have increased in the Shenandoah-Cumberland Valley Fruit District yet remain significantly lower than in Washington and New York (Table 5.1). The West Virginia sub-region has increased densities from 74 trees per acre in 1994 to 117 trees per acre in 2004 (USDA NASS 2004). Likewise, tree densities in the Shenandoah Valley counties of Virginia have improved from 94 trees per acre in 1997 to 131 trees per acre in 2005 (USDA NASS 2005). In Pennsylvania, Franklin County averaged 127 trees per acre while Adams County led the Fruit District with 178 trees per acre in 2008. Only 211 acres spread over 19 farms in Adams County (PA) reported densities of 500 trees or more per acre (USDA NASS 2008).

Results from the mail survey confirm sub-regional differences in average tree densities (Table 5.2). Overall, 62.8 percent of growers in the Fruit District indicated that they grew at least some apples on high-density plantings. I point out, however, that the survey question did not specify the number of trees per acre that qualifies as ñhigh-density.ò High-density in the survey is, therefore, a relative term. What qualifies as

high-density according to some growers in the Shenandoah-Cumberland Valley Fruit District would not necessarily be viewed as high-density in Washington.

Around 30 percent of the growers in the Fruit District use expensive post and wire trellises in at least some of their orchard blocks (Table 5.2). Less than 20 percent of growers in the Cumberland Valley and West Virginia sub-regions use trellises. While five West Virginia growers indicated that they had used trellis systems, trellising is not common in the orchard landscapes in the sub-region. This contrasts with Adams County (PA) where 41.7 percent of the respondents use trellising. While it is not uncommon to see large blocks of trellised orchards in Adams County, the overwhelming majority of orchards in the Shenandoah-Cumberland Valley Fruit District still feature stand-alone trees on semi-dwarf rootstock.

Table 5.2 Growers Reporting High-Density Plantings

Sub-Region	High-Density Plantings	High-Density Plantings with Trellising
Adams County	75.0%	41.7%
Cumberland Valley	46.2%	15.4%
West Virginia	48.3%	17.2%
Virginia	68.2%	36.4%
Overall	**62.8%**	**30.7%**

Source: Authorôs Mid-Atlantic Apple Survey

Several possible explanations can be offered for the discrepancies in average tree densities between the Shenandoah-Cumberland Valley Fruit District and other apple-growing regions. Some growers in the Fruit District do not feel it is necessary to bear the costs of conversion to higher densities when their current orchards are productive and profitable. For example, one Pennsylvania grower reaches annual averages of 1,500 bushels from densities of 218 trees per acre (Lehnert 2012b). Environmental conditions are also a potential limiting factor in growers adopting higher tree densities. The longer growing season in the Shenandoah-Cumberland Valley Fruit District promotes more vigorous plant growth compared to New York. The same variety with the same rootstock which could be planted at 1,000 trees per acre in New York might only accommodate 700 trees per acre in the Shenandoah-Cumberland Valley Fruit District (Marini 2010). In an example of disenchantment discontinuance, one progressive grower in Pennsylvania was displeased with the outcome after planting orchard blocks with five feet of spacing between trees in a row. He now plants all new blocks of trees at six feet of spacing per row to allow for tree growth (Source 1103 2010). Another environmental constraint is water. Dwarf trees require irrigation and the availability of irrigation water is limited in many parts of the Fruit District (Lehnert 2012b). This is especially true in the northern Shenandoah Valley where surface water is uncommon (Marini 2010). According to the 2007 Census of Agriculture, less than 2 percent, or 109 acres, of the combined orchard acreage in Frederick County (VA) and Berkeley County (WV) was irrigated. Adams County (PA) has more spring-fed farm ponds but still only irrigates around 10 percent, or 1,580 acres of its orchard land (USDA NASS 2009b).

Economics is another obstacle to switching to high-density plantings. For example, some growers may make enough money to justify staying in business but capital shortages make it difficult to reinvest in new orchard layouts (Belrose 2006a). Growers who focus almost exclusively on producing apples for the processing market are especially reticent to convert to high-density plantings with dwarf rootstocks. The processing growersô argument is that the processing market does not support high enough prices to pay back the initial establishment costs of orchards with very high tree densities (Coughlin, Keene & Associates 1997; Marini 2010; Source 4128 2010). The very high densities of 800 or more trees per acre necessitate the higher prices that growers receive in the fresh market. Still, several experts feel that growers can and should increase the tree densities of their processing blocks as long as it is with apple varieties that are not prone to biennial bearing patterns (Robinson and Hoying 2001; Marini 2010). Of those growers in the Shenandoah-Cumberland Valley Fruit District who send at least 95 percent of their apple crop to the processors, only 45.2 percent use high-density plantings and these high-density plantings would most likely be in the 150ï 400 trees per acre range. A mere 6.5 percent of growers in this subgroup use trellising. The reluctance of growers to convert their processing blocks to higher densities and the high percentage of apples intentionally grown for the processing market compared to Washington and New York partially explains why overall tree densities are lower in the Shenandoah-Cumberland Valley Fruit District than those two states.

Technological Innovations

Uncertainties about the future availability of labor and the desire to lower their highest variable cost have encouraged growers to look at mechanization as a way to increase labor efficiency. Used in many European apple orchards, mobile orchard platforms allow workers to prune, hand thin, and harvest the higher parts of a tree without having to climb up and down ladders. In trials held in New York and Pennsylvania, significant savings were made when using platforms for pruning, hand thinning apples and peaches, and the harvesting of peaches (Sazo *et al*. 2010; Baugher *et al*. 2011a). Current drawbacks to the mechanized platform include the high cost of a factory-made model and the fact that mechanized platforms only work well with specific high-density tree systems that use tall, narrow trees shaped to form a ñwall.ò Platforms are not effectively used on low-density, semi-dwarf trees because of tree shape. Platform technology innovations have been further enhanced as some growers have modified or invented their own platforms that are either less expensive than factory-made models or more compatible to their orchard layout (Figure 5.3) (*Fruit Grower News* 2006; Sazo *et al*. 2010; Baugher *et al*. 2011a; Shupp *et al*. 2011; Warner 2011b). Acceptance rates of mobile platforms have been low. In the state of Washington, 10 percent of surveyed growers use platforms for orchard tasks but only two of the 35 growers that reported using platforms use them for harvesting apples (Warner 2011b). A Pennsylvania grower who has experimented with platforms has found that hand harvesting with ladders and buckets is more efficient in his orchards (Lehnert 2012b).



Figure 5.3 Examples of New Orchard Technologies

Top ï Workers pruning a tall spindle trellis apple orchard using a mobile orchard platform in New York; *Center Row* - Student researchers from Carnegie Mellon University instruct a grower on how to direct the self-propelled robotic vehicle from a hand-held wireless computer. The vehicle equipped with sensor networks was in motion when the picture was taken; Adams Co. PA; *Bottom* ï Demonstrating the mechanical peach thinner at the Peach Open House, Penn State Fruit Research & Extension Center

Top Picture from *New York Fruit Quarterly*, all other Photographs by Joseph P. Guttmann

The holy grail of mechanization is finding an appropriate harvester. Past attempts have not proven successful. For example, in field trials of mechanical tree shakers held in the West Virginia sub-region throughout the 1970s, the falling fruit would hit the lower tree limbs causing excessive bruising (Elliot 1993). Two new mechanical harvesters using vacuum suction were recently tested and show some potential. One model even scans the apple to determine if it is up to grade or should be culled. Sorting out the culls in the field allows the grower to save money by sending the inferior fruit straight to the processor, bypassing packinghouse storage and sorting fees (Warner 2011a, 2011c). Both harvester models are mounted on mobile orchard platforms and when combined with the vacuums, could potentially increase the labor pool by opening up harvest jobs to people of less physical strength (*Fruit Grower News* 2009a; Sazo *et al.* 2010; Warner 2011a).

Other high technology advancements that seek to increase production efficiencies are sensor networks, digital imaging, and robotics. Sensor networks and digital imaging are being developed to monitor pest presence, determine crop loads, and monitor tree temperatures to detect possible tree stress. Robotic vehicles equipped with sensor networks could then travel through the orchard gathering information and building a database for each tree (Musselman 2009b; *The Economist* 2009; Hull *et al.* 2011). The increased availability of data will enhance the growerôs ability to make the best possible decisions concerning tree care. In the long-term, researchers are working to develop robots that can cost-effectively handle field tasks such as pruning and picking fruit (*The Economist* 2009). While the potential time-saving field robots are still in the prototype

stage, sensor technology is already being applied to improve spraying. For example, weed-seeking sensors only spray when chlorophyll is detected, cutting down on herbicide usage (Musselman 2009b).

Researchers at Pennsylvania State University (Penn State) and the growers of Adams County (PA) have been in the forefront of the national effort to test and apply new orchard technologies. In 2005, development pressures and concerns over the health of the rural economy in Adams County led to a grassroots agricultural summit of community leaders, government officials, growers, researchers, and other leaders in the fruit industry to discuss ways to ensure the long-term viability of agriculture in the county. The outcome of these meetings was the Adams County Ag Innovations project which seeks to implement new innovative approaches to land-use planning, marketing, and field production techniques (*Fruit Grower News* 2006; Ellis 2009; Harsh 2011).

As one priority of the Adams County Ag Innovations project, the goal of the Specialty Crop Innovations team is to increase the competitiveness of the areaôs orchards through labor efficiencies and increased fruit output per acre. The team, led by researchers from Penn State, has adopted a systemic approach where the orchard layout and increased tree densities will be compatible with the future mechanization of orchard tasks (Baugher *et al*. 2011a; Sparks 2012). Research in Adams County (PA) is also being conducted on mechanical harvesters, sprayers, mobile orchard platforms, and mechanical string thinners for peach blossoms (*Fruit Grower News* 2006; Baugher 2010; Lehnert 2010g; Baugher *et al*. 2011b). Early research undertaken at the behest of the Adams County Ag Innovations project enabled the Specialty Crop Innovations group to be well

positioned to receive several multi-million dollar USDA Specialty Crop Research Initiative grants. One of these grants has resulted in a collaboration with researchers and students from Carnegie Mellon University to design a workable, self-propelled robotic vehicle for orchard use (Figure 5.3) (Ellis 2009; Musselman 2009b; Baugher 2010). One tangible result of the Specialty Crop Innovations research is that several area growers have already purchased mechanical string thinners for the thinning of peach blossoms (Lehnert 2011a).

Technological advances also impact the apple industry outside the orchard. Over the past 30 years, packing companies for the fresh wholesale market have invested in new technologies such as washers and fruit waxing machines. As the washing and waxing of fruit became a universal demand by the retailers buying fruit, some packers installed the washing and waxing machines while others quit packing (Rice 2010). Modern packing lines now have electronic weight sizing machines and digital imagers that sort the fruit by size and color. Some packinghouses even use infrared sorters that can look inside the apple and can determine the appleôs sugar content or if there is an internal breakdown (Schotzko 2004; Marini 2010; Rice 2010; Lehnert 2012a). A high volume of fruit is required to run through the packing line in order to pay for the expensive technological upgrades (Rice 2010). According to Rich Marini, head of the horticulture department at Penn State, packinghouses in the Shenandoah-Cumberland Valley Fruit District need to pack a minimum of one million boxes of apples annually just to be able to afford the new technology. Smaller packers have found that the expense of the machinery upgrades could not be justified by the small volume of apples that they were packing (Marini

2010). For example, Adams Countyôs (PA) Garretson Orchards and the Mountain Growers Cooperative stopped packing sometime after 1999 and the last packinghouse in Clarke County (VA) closed in 1994 (Coughlin, Keene & Associates 1997; Horst 1999). The effect of this new technology has been a consolidation of packinghouses combined with an expansion of capacity by many of the packers who stayed in business (Schotzko 2004; Marini 2010; Rice 2010; Source 1103 2010).

New Apple Varieties

Though consumers are accustomed to seeing the same types of apples at the grocery store, varieties have been anything but static over the past 100 years (Table 5.3). The popularity of apple varieties has waxed and waned due to the appleôs appearance, taste, degree of difficulty to grow, and durability during storage. For example, while the Ben Davis, a popular apple in the early 20th century, was noted for its high yields and ability to hold up during storage and shipping, its poor eating quality and susceptibility to blister cankers caused it to fall out of favor (Folger and Thomson 1921). Over time, the production of commercial apples became concentrated into fewer varieties (Table 5.3). By 1990, the two leading apple varieties accounted for nearly 60 percent of national production compared to just 27 percent in 1915 (Upshall 1970; USDA ERS 2010b).

Table 5.3 Historical U.S. Apple Production by Variety

1915	%	1964	%	1990	%	2008	%
Baldwin	13.4	Delicious	24.3	Red Delicious	44.0	Red Delicious	24.3
Ben Davis	13.3	McIntosh	13.1	Golden Delicious	15.8	Gala	12.9
Northern Spy	6.1	Golden Delicious	8.0	Granny Smith	6.8	Golden Delicious	11.1
Winesap	5.1	Rome	7.8	McIntosh	6.5	Granny Smith	10.4
Rhode Island Greening	4.7	Jonathan	7.3	Rome	5.7	Fuji	8.2
Jonathan	3.6	Winesap	5.4	Jonathan	3.5	McIntosh	4.6
Rome	3.1	York Imperial	5.0	York Imperial	2.4	Rome	3.2
Total	**49.3**		**70.9**		**84.7**		**74.7**

Sources: Upshall 1970; Lynch 2010; USDA, ERS *U.S. Apple Statistics 2010*

While Red Delicious is still the most widely grown variety, it is clearly on the decline. The Red Delicious is noticeably losing market share to the Gala and Fuji varieties. These two new supermarket mainstays had a combined 21.1 percent share of U.S. production in 2008 (Table 5.3). From 2006ï 2008, the Red Delicious was only the fourth most common variety planted in Pennsylvanian orchards (Table 5.4). More telling is that only 2.1 percent of trees sold by Washington nurseries in 2008 were Red Delicious while 14.7 percent were Galas and 18.8 percent were Fuji apples trees (Buckner 2009).

Table 5.4 Top Five Apple Varieties Planted in Pennsylvania, by Percentage 2006–2008

Variety	Percentage
Honeycrisp	18.8
Fuji	16.6
Gala	11.9
Red Delicious	6.2
Cameo	5.8

Source: USDA NASS *Pennsylvania Orchard and Vineyard Statistics 2008*

New apple varieties are developed from chance seedlings or through a breeding program. Chance seedlings are trees grown from seeds that, by genetic chance, produced fruit that had desirable marketable qualities (Schotzko 2004). Although a rare occurrence, recent examples of chance seedlings that have made it to the supermarket include the Cameo, Ambrosia, and Lady Alice (Brown and Maloney 2009). Many other new varieties are intentionally developed through public and private breeding programs. Breeders also produce new strains of existing varieties to improve certain characteristics such as disease resistance, coloring, and storage durability (Schotzko 2004; Higgins 2005; Belrose Inc. 2006b). Contrary to the introduction of a new variety, improving the strain of an existing variety usually involves more incremental changes that the average consumer may not even notice at the supermarket. As newer strains are introduced, sometimes the older strains lose their economic edge or become obsolete. For example, when Gala was introduced, it was a yellowish apple with an orange-red blush. Now it is a red apple because breeders have selected mutations for red color. A strain of Gala that

was profitable 15 years ago may no longer be profitable today (Schotzko 2004; Belrose Inc. 2006b; Marini 2010; Warner and Hansen 2010).

The appearance of the apple is a major motivating factor in determining whether a consumer will buy it (O'Rourke 1994; Belrose Inc. 2008b). Red apples that have fuller color sell better and at higher prices than apples with less red coloring (Schotzko 2004; Higgins 2005; Warner and Hansen 2010). Some of the growth in the demand for new Fuji and Gala trees has been due to growers replanting their older strains with higher coloring strains (Schotzko 2004; Buckner 2009; Warner and Hansen 2010). Sometimes by breeding for one characteristic, other traits are sacrificed. In the case of Red Delicious, breeding for redder color to enhance grower returns backfired as its reputation for taste suffered (Higgins 2005). This has been one of the reasons behind the dramatic decline in Red Delicious production and it allowed an opening for the introduction and rapid acceptance of newer varieties such as Gala, Fuji, and Honeycrisp.

Purdue University, Rutgers University, and the University of Illinois have a long-term cooperative breeding program that focuses on developing disease-resistant apples. The programôs goal is to introduce marketable varieties that have good eating qualities but that can also reduce the amount of fungicides used in the orchard. For example, Redfree, Pristine, and Gold Rush apples were bred by the program to be resistant to apple scab (Lehnert 2010a, 2011f; PRI 2010). While still not common, some Shenandoah-Cumberland Valley Fruit District growers are selling disease-resistant varieties directly to the consumer through on-the-farm retail outlets and at farmersô markets (Kitchen and Boarman 2010).

Pushing apple breeding across another frontier is the development of non-browning apples through genetic modifications. By suppressing the gene that causes browning when apples are bruised or sliced, processers will avoid having to soak fresh-cut slices in preservatives. At this time, major apple associations such as the U.S. Apple Association and the Northwest Horticultural Council are against the introduction of genetically modified apples into the market. The associations fear that the backlash against genetically modified foods among some sectors of the population could negatively affect the perception of all apples. While still a few years from being on the market, genetically modified apples could have a larger impact on the market in the future (Lehnert 2011b; Pollack 2012).

From the perspective of a grower selling on the fresh wholesale market, the decision to grow a new variety entails both risks and rewards. Grocery stores may sell up to 18 varieties of apples but a limited amount of shelf space also limits the number of varieties that will be long-term successes (Hansen 2009; Warner 2009a; Eddy 2010; Gomez *et al.* 2010; Hornick 2011c). The question becomes which, if any, new varieties should the grower pursue? Growing a new variety can be risky. If a new variety does not gain popularity with consumers, the grower will be saddled with a poor long-term investment. On the other hand, if the grower does not stay current with his or her varietal mix then he or she may be left with only low-margin varieties, leaving potential profits on the table. Growers willing to take risks will often be rewarded with premium prices if a new variety becomes popular with the public (Belrose Inc.2010a, 2010c; De Marree 2010; Marini 2010; Warner and Hansen 2010).

Price premiums are a result of strong demand and the lag time it takes to plant enough trees to meet that demand. A good recent example of this phenomenon is the Honeycrisp. Even though the variety has been available to growers for almost 20 years, its popularity has exploded within the last decade. The Honeycrisp apple commands the highest retail prices because consumer demand outstrips current supplies. Many growers were initially reluctant to plant Honeycrisp because the apples are difficult to grow and store (Rosenberger *et al*. 2001; Warner 2010a; Schupp 2010; Hornick 2011c, 2011d). Adams Countyôs (PA) Rice Fruit Company has even upgraded its sorters on its packing lines in part because the Honeycrisp has more flaws and it is a more difficult apple to handle (Lehnert 2012a). Despite the varietyôs inherent challenges to growers and packers, Honeycrisp is now the most popular variety planted in Washington, Pennsylvania, and other locations (USDA NASS 2008, 2011).

Marketing Clubs

As supply catches up with demand, a variety eventually loses its ability to command premium prices and it becomes a lower-margin commodity (Schotzko 2004; Belrose Inc. 2006b; Milkovich 2010a). An attempt to break this pattern has led to the ñmanagedò release of new varieties and the formation of marketing clubs. The premise behind a marketing club is to maintain the price premium of a variety by limiting supply, creating demand, and ensuring quality (Table 5.5). Clubs are operated by a marketing company that has either developed, purchased, or is otherwise entitled to the exclusive rights of a trademarked variety. Club membership is available only to a limited number of growers. Generally, these growers must pay up-front acreage fees and production

royalties to the marketing company. In exchange, the company manages supply by limiting the number of acres in production and promotes the variety through distribution agreements and marketing. Often, managed clubs are a macro network of growers (OõRourke 2001; Cain 2005; Belrose Inc. 2006b; Milkovich 2010a). For example, Jazz apples are grown in Washington, New Zealand, France, and Chile in order to maintain a year-round fresh supply (ENZA 2010). Just as important, by maintaining control over where its apples are produced and by whom, the marketing company aims to protect the image of its product by eliminating the possibility of poor quality fruit reaching the market. After all, image is essential to maintaining the price premium (Belrose Inc. 2006b; Milkovich 2010a).

Table 5.5 Average Washington Packinghouse Shipping Price for Select Apple Varieties, 2011

Variety	Price per Box
SweeTango	$54.53
Honeycrisp	$45.81
Kiku Fuji	$39.59
Piñata	$31.21
Gala	$20.38
Granny Smith	$20.15
Fuji	$19.72
Golden Delicious	$18.38
Red Delicious	$18.02

Note: ñClubò apple varieties in ***bold italics***

Source: Washington Growers Clearinghouse *Apple Price Summary 2010-2011 Marketing Season*

Another benefit of marketing clubs is that they reward the developer of the new variety. Historically, new varieties developed at a land-grant universityôs breeding program were released to the public free of charge. Decreased public funding because of school budget cuts has led to increased protection of intellectual property rights in order to bring in revenue. New varieties were patented, earning the breeding program small royalty payments for every tree sold (Cain 2005; Belrose Inc. 2006b; Ten Eyck 2006; Milkovich 2010a). Honeycrisp is an example of a non-club variety that was developed in this manner and had generated over $6 million in tree royalties for the University of Minnesota by 2007. Unfortunately for the University, Honeycrispôs U.S. patent expired in 2008 (Olsen 2007).

Public institutions can also earn significant funding dollars by selling the rights of new varieties they have developed to private companies. For example, the University of Minnesota sold the rights to its MN 1914 variety to the Next Big Thing growersô cooperative that is marketing it as the club variety SweeTango (Ten Eyck 2006; Hubbuch 2010; Lehnert 2010h; Milkovich 2010a). Instead of open releases, land-grant university breeding programs can promote their own stateôs apple industry and reward their primary funders, the state and its growers associations, through exclusivity. Whereas SweeTango apples will be grown in Washington, Michigan, New York, Nova Scotia as well as Minnesota, some of the new varieties being developed by Cornell University will only be available to New York growers (*Good Fruit Grower* 2010a; Lehnert 2010h). For example, a marketing club organized by the state of New York has been set up to manage a new apple that is essentially an easier-to-grow Honeycrisp (*Good Fruit Grower* 2010c).

While there are a number of advantages, the managed club business model has its detractors. In 2009, an informal poll of growers on an industry website and e-newsletter found that 76 percent thought that club varieties were bad for the apple industry (Eddy 2010). Some industry insiders think that there will be a glut of club varieties on the market and that not all will be distinctive enough to survive (Hansen 2009; Warner 2009a; Eddy 2010; Hornick 2011c). One grower from the Shenandoah-Cumberland Valley Fruit District reported that he was ñburnedò by growing a club variety that turned out to be a flop (Glaize 2010a). Many growers and industry insiders also feel that the club system is unfair to smaller acreage growers who cannot afford to experiment with risky new varieties as much as the large-acreage growers. The small-acreage growers are then shut out from planting the variety once it proves successful (Belrose Inc. 2006b; Ten Eyck 2006; Hansen 2009; Glaize 2010a; Milkovich 2010a).

Accessibility issues have hindered growers of the Shenandoah-Cumberland Valley Fruit District from adding club varieties to their crop portfolio. Currently, the growing of club varieties is limited to about three large Adams County (PA) operations that are sublicensed from the Washington marketer Columbia Marketing, Inc. to grow the Kiku Fuji (Lehnert 2012b). As one Fruit District grower notes, one problem is that many of the current club varieties are designed for northern or western climates and do not perform as well in more southerly climates such as Virginia (Glaize 2010a). Unlike Cornell University which has been proactive in breeding potential managed varieties for New York growers, the land-grant universities of the Shenandoah-Cumberland Valley Fruit District lack the funded apple breeding programs for a similar enterprise (*Good*

Fruit Grower 2010a, 2010c; Marini 2010). As the trend towards the ñmanagedò release of new apple varieties continues, the lack of access to these promising, high-value varieties threatens to put the Shenandoah-Cumberland Valley Fruit District at a competitive disadvantage relative to other apple-growing regions.

Heirloom Apples

The introduction of non-exclusive new varieties has been a boon to growers who retail directly to the consumer through farm stands and farmersô markets. By having a quick rotation of products, the grower hopes to spark consumer interest and inspire more return shopping visits (Roth 1999; Hansen 2009; Kitchen and Boarman 2010). One grower noted that at the farmersô markets, anything different or new sells well (Lehnert 2010a).

Ironically, this quest for differentiation has led to a renewed interest in planting heirloom varieties. Heirlooms were once popular commercial or backyard orchard varieties that fell out of favor in the mass market due to competition from the current commercial varieties. Examples of heirlooms now being grown and sold in this small but growing niche market include Grimes Golden, Arkansas Black, and the Albemarle Pippin (Nagurny 2002; Mangino 2007; Merwin 2008; Canfield 2011). In the Shenandoah-Cumberland Valley Fruit District, 16.7 percent of the respondents to the mail survey reported that their sale of heirloom varieties increased in the past 15 years. Almost 80 percent of the respondents with heirloom apples either had an on-the-farm retail outlet or attended farmersô markets. One grower in Adams County (PA) even specializes in selling ñvintageò apples nationally through gift boxes (GWP 2011).

Heirlooms are also benefiting from another growing niche market, the making of local hard cider. Cider makers use varying blends from heirlooms like the Golden Russet and Roxbury Russet. Some growers have even planted traditional European cider varieties that have little use outside of cider-making because of their bitter taste (Smock and Neubert 1950; Holz-Clause 2003; Mangino 2007; Canfield 2011; Lehnert 2011f). Located just outside the Fruit District in southwestern Frederick County (MD), Distillery Lane Ciderworks relies on blends of traditional European cider and heirloom varieties to produce its hard cider. Another larger operation, the Hauser Estate Winery in Adams County (PA), produces its Jackôs Hard Cider primarily from blends of apples such as Rome and Granny Smith that were growing in its commercial orchards prior to the start of the cider operation. Both Distillery Lane Ciderworks and the Hauser Estate Winery began producing hard cider in 2008 (DLC 2011; JHC 2011). While hard cider-making is in its nascent stages in the Shenandoah-Cumberland Valley Fruit District, potential market opportunities will likely continue to exist for current growers or hobby farmers to supply local, artisanal ciders to higher-end bars and restaurants in nearby large cities.

Production, Price, and Consumption Trends

After an expansion in bearing acres in the late 1980s and early 1990s, the apple industry entered a period of difficulty in the late 1990s and early 2000s. Large domestic apple crops were compounded by troubles in the export market and increased competition from foreign producers in the domestic apple juice market (Edwards 2004; Pollack and Perez 2005). A slow recovery from the 1997 Asian financial crisis induced Washington growers to divert fresh market apples intended for the important Asian export market to

other domestic markets (O'Rourke 2001; Edwards 2004; Veeck *et al*. 2006). At the same time, a torrent of cheap apple juice concentrate from China was being imported, thus further depressing the market. What had been a volatile up and down apple juice market was replaced by years of low prices (Lehnert 2007b). Today, growers are receiving about the same price for juice apples as they did 25 years ago (Table 5.6). This does not take into consideration the impact of inflation on the dollar and the rise in costs to the orchard operation. As a result, many marginal growers have left the business while other growers removed old, underperforming trees (Pollack and Perez 2005; Belrose 2006b; Freshplaza 2008).

Table 5.6 United States Production, Per Capita Consumption, and Average Prices for Apples, 1984–2009

	1984	1987	1990	1993	1996	1999	2002	2005	2008	2009
Commercial bearing acres	426,220	461,020	485,460	460,930	459,370	461,500	400,950	378,860	350,590	347,800
Production (*million pounds*)	8,271	10,242	9,658	10,611	10,304	10,580	8,405	9,763	9,540	9,708
Total per capita apple consumption *(pounds)*	44.3	48.2	47.9	48.3	46.4	47.1	43.1	45.1	48.0	48.0
Per capita fresh consumption (*pounds)*	18.4	20.8	19.6	19.0	18.7	18.5	16.0	16.7	16.2	16.3
Per capita apple juice consumption (*pounds)*	18.4	19.4	20.7	21.3	20.3	21.4	21.5	22.3	25.1	25.1
Percentage sold in fresh market	56.5%	54.9%	57.5%	58.1%	61.2%	56.4%	63.8%	63.3 %	65.8%	66.0%
Percentage of fresh market exported	11.3%	13.9%	14.8%	22.7%	24.5%	19.6%	21.3%	24.4%	27.3%	27.8%
Average fresh market price per pound	15.5¢	12.2¢	20.9¢	18.2¢	20.9¢	21.2¢	25.7¢	27.6¢	30.1¢	31.8¢
Average canned price per pound	6.8¢	5.9¢	8.3¢	6.9¢	10.0¢	7.7¢	8.1¢	7.5¢	12.0¢	8.0¢
Average juice price per pound	4.8¢	2.9¢	5.9¢	4.1¢	7.8¢	4.9¢	4.9¢	3.3¢	7.0¢	4.4¢

Sources: USDA, NASS. *Noncitrus Fruits and Nuts Summary* (various years); USDA, ERS. *Fruit and Tree Nuts Situation and Outlook Yearbook* (2010)

Emerging long-term trends from the restructuring of the apple industry can be seen in Table 5.6. In the past 20 years, bearing acreage has declined significantly from a high of 485,460 acres in 1990 to 347,800 acres in 2009. Despite the reduced acreage, less change in the annual production of apples has occurred as growers have upgraded their orchards by planting higher tree densities (Schotzko 2004). In addition to producing more pounds of apples per acre, growers have increased the percentage of the annual crop being sold on the fresh market from the mid-50s in the 1980s to the mid-60s in the 2000s (Table 5.6). The incentive underlying this shift has been the growing price gap between the fresh and processing markets. Average fresh market prices that had been three times the average processing price in the early 1990s increased to four times the average processing price by the late 2000s (Belrose Inc. 2010c). Unlike the processing sector, fresh market growers have outpaced inflation by changing their varietal mix to higher-priced varieties. Even growers in regions that historically have produced apples specifically for the processing market have been diversifying their product mix to include more fresh market apples (Lehnert 2007a; Harsh 2011).

A respite from low prices came in 2006 and lasted through 2008 (Table 5.6). Overall food price inflation due to the rising price of oil and tight supplies of grains allowed retailers to ease the pressure on their margins by gradually raising prices (Belrose Inc. 2010c). Strong demand for fresh apples allowed growers to market fruit that usually would have been used for lower-value purposes. For example, small apples that would normally be used for sauce or juice were being sold fresh in bags (Lehnert 2007a; Freshplaza 2008). Apple juice prices were also higher as the tighter supplies of

lower grade apples in the United States coincided with poor seasons in China and Poland, the leading exporters of apple juice concentrate. The price rebound has since reversed as consumers have become more price conscious with the economic recession and processing prices have again slumped (Belrose Inc. 2010c). The year ñ2009ò was also included in Table 5.6 because those were the prices that growers were receiving at the time the survey was mailed for this dissertation

Trailing only bananas in popularity, apples rank second in per capita fresh fruit consumption in the United States (Perez 2011). Despite the recent strong demand for fresh market apples, per capita fresh consumption has slipped from 20.8 pounds per person in 1987 to 16.3 pounds per person in 2009 (Table 5.6). The average production of fresh market apples has actually increased during this period but has not kept pace with population growth, causing the decline in per capita consumption (USDA ERS 2010a). Consisting mostly of applesauce and pie fillings, per capita canned apple consumption is also down about a pound from the late 1980s and early 1990s. A reflection of its status as a mature sector of the industry, consumption of canned apples has been hovering around 4.5 pounds per person for the past decade (USDA ERS 2010a). Balancing the decline in the fresh and canned apple sectors has been a rise in the consumption of apple juice. Per capita fresh-pound equivalence has risen from 20.7 pounds in 1990 to 25.1 pounds or 2.1 gallons in 2009 (Table 5.6). This gain has been captured by the increases in imported apple juice concentrate as domestic production of apple juice has declined by over 40 percent during this time period (Schotzko 2004; USDA ERS 2010a). In 2011, tests indicating higher arsenic levels in some apple juices than what the Food and Drug

Administration tolerates for public tap and bottled water were publicized by the popular ñThe Dr. Oz Show,ò and the *Consumer Reports* magazine. It is not yet known whether these reports will have a negative impact on the long-term trend of rising apple juice consumption (*Consumer Reports* 2012).

Age is the attribute that provides the most distinctive patterns in relative apple consumption. Processed apple products are most likely to be purchased by households with children (Rowles *et al*. 2001). Although children aged five and under account for less than 10 percent of the total population, youngsters drink almost one-third of the apple juice consumed in this country (Perez *et al.* 2001). Per capita consumption of fresh apples has a similar pattern, peaking in the early and middle childhood years. Processed apple products seemingly lose their appeal as people age. Adults have significantly lower per capita consumption of apple juice and applesauce than any other age group. Applesauce consumption eventually exceeds the norm for those aged 60 years or older. The low per capita consumption rates among adults is a worrisome trend to an industry that has seen several of its sectors experience stagnant or declining rates of growth (Rowles *et al*. 2001).

Declines in per capita apple consumption can be partly attributed to competition from other fruit. In the past, apples, pears, and citrus were the primary domestic-produced fruit available in the winter. This advantage is now being challenged by the increased importation of Chilean table grapes and Mexican strawberries (Perez *et al.* 2001; Lucier *et al*. 2006; Huang and Huang 2007; USDA ERS 2010a; Perez 2011). Even within the United States, the development of late-season peaches has caused an overlap in

marketing periods with early- and mid-season apples. Competition is also coming from an increasing array of non-traditional fruits such as mangoes, avocadoes, and clementines (Lucier *et al*. 2006; Huang and Huang 2007; Harper 2010). These fruits not only act as potential substitutes for apples but may compete with apples for vital shelf space in the produce section of grocery stores (Belrose Inc. 2010c).

Fresh-Cut Apple Slices

Backed by extensive advertising campaigns, manufactured snacks such as chips, cookies, crackers, and sodas provide formidable competition for the consumerôs dollar. The apple industry has countered with better tasting fresh varieties for eating out of the hand and new packaging for apple juice and applesauce designed for convenience (Belrose Inc. 2006b, 2010c). Applesauce now comes in single serving cups for easy packing in lunches and in a variety of flavors and colors designed to appeal to children or adults.

Fresh-cut apple slices are another entry into the snack market. Treated with a calcium and Vitamin C mixture to retard browning, fresh-cut apples have a shelf-life of about three weeks (Cable 2010). Fresh-cut apple slices have been targeted towards schools and large institutional foodservice buyers that would like to serve fresh apples but find the slicing, peeling, and coring of fresh apples prohibitively labor-intensive. The non-browning trait of fresh-cut slices now makes the apple a more appealing item to be used on salad bars and in specialty salads served at chain restaurants. Fresh-cut apple slices are also being used by bakeries and as an item available for sale in vending machines (Rowles *et al*. 2001; Brushett and Lacasse 2006; Kremer 2006; Blythe 2010)

Despite early enthusiasm that fresh-cut apple slices could have a similar market-changing impact as baby carrots did for fresh-cut vegetables, the market has not taken off as fast as expected (*Fruit Grower News* 2005; Brushett and Lacasse 2006; Belrose Inc. 2010c). Output doubled from 2004 to 2006, but the momentum has since slowed to a 22 percent gain from 2007 to 2010 (USDA ERS 2010a). Fresh-cut slices have struggled in the retail market due to higher prices compared to fresh-cut vegetables and whole apples (Belrose Inc. 2010c; Karst 2011a). Although proven popular with schoolchildren, many school foodservice directors do not feel that the pre-sliced apples are a good value at the current price (Brushett and Lacasse 2006; Rowles *et al.* 2001). On the other hand, fresh-cut slices have received a strong boost from fast-food restaurants. As part of an attempt to revamp their image, McDonalds has been offering healthier menu options at its stores. Fresh-cut Apple Dippers with caramel sauce are now included in every Happy Meal. Additionally, a fruit and walnut salad and fruit and maple oatmeal are adult offerings using fresh-cut apples (*Fruit Grower News* 2005; Pollack and Perez 2005; Belrose Inc. 2006; Brushett and Lacasse 2006; Hornick 2011b). As a result of the new menu additions, McDonalds purchased 60 million pounds of apples in 2010 (Kowitt 2011). Other fast-food restaurants such as Burger King, Subway, and Arbyôs have followed McDonaldôs with their own versions of salads containing apples and are using fresh-cut apples as side items (Brushett and Lacasse 2006; Hornick 2011b).

In 2009, growers were paid 15.1 cents per pound for apples that were used for fresh-cut slices. This was almost twice the price processors paid for the apples used for canned or frozen uses but just one-half the price of regular fresh market apples (USDA

ERS 2010a). The fresh-cut market can also provide an outlet for smaller apples and apples that are downgraded for color (Brushett and Lacasse 2006; Hornick 2011b). Because the product and uses are mainly differentiated by the convenience factor, store-bought, fresh-cut apple slices to may act as a substitute for fresh market whole apple sales. Substituting a lower-value apple for a higher-value apple will hurt growers in the long-term (Belrose Inc. 2006b). On the other hand, fast-food restaurants were a previously untapped market for fresh apples and schools were largely underserved. The growth of these markets will help the overall industry by offering another outlet in which to sell apples. At this point, fresh-cut slices are still a niche category estimated to be less than four percent of the total tonnage of apples grown in the United States (Wheat 2012). The potential remains for expansion of this sector especially if costs can be lowered enough to make large purchases by school districts feasible.

Fruit Hill Slices, a joint venture started in 2006 between two large growers in Frederick County (VA), has been the only company from the Shenandoah-Cumberland Valley Fruit District to venture into the fresh-cut apple slice market. Marketed under the brand name ñGrab Apples,ò the apples are sent to a processor in New York to be sliced and packed in two- or three-ounce packets. The apples are then marketed to schools in Virginia as healthy snacks (Kremer 2006). Part-owner of Fruit Hill Slices, Phil Glaize says the apples have been well-received by the students. Glaize expressed optimism over the future potential of the enterprise but admits that he and his partner have not yet put enough effort into expanding the market for the product (Glaize 2010a).

The Shenandoah-Cumberland Valley Fruit District is the only major apple-growing region in the United States that does not have a fresh-cut apple slicing facility. The nearest fresh-cut apple slicing facilities are in eastern Pennsylvania, a two-hour drive from Adams County (PA) (*Fresh Cut* 2008; Nelson 2010). Although one eastern Pennsylvanian slicing operation expects that nearly one-half of its apple supply will be grown in the eastern United States, the majority of the apples used by East Coast slicers are currently sourced from the western states (Brushett and Lacasse 2006; Nelson 2010). Estimated entry costs for setting up an operation capable of producing 500ï 100 pounds of apples slices per hour exceeds $1,500,000 (Brushett and Lacasse 2006). The high costs and the risks entailed in establishing a market have thus far deterred the entrants of new local processors. While some growers may be able to supply the two facilities in eastern Pennsylvania, the lack of a local slicing facility is a handicap to growers in the Fruit District who would be interested in providing apples to the fresh-cut apple slice market.

Organic Apples

Organics are another niche market that has been gaining traction in the past 15 years. Organic farming is a ñnaturalò process that avoids the use of ñsyntheticò chemicals to aid production (Schotzko 2004; *Fruit Grower News* 2009b). The strength of the organic market can be seen in the growth and popularity of specialty retailers such as Whole Foods, as well as the increasing organic sales at traditional grocery stores (Schotzko 2004; Dimitri and Oberholtzer 2009). Consumers have been willing to reward organic growers with a price premium that averaged 20.7 percent higher than

conventionally grown apples in 2008. For organic consumers, the added value is in the production process. Many organic consumers have concerns over the negative environmental impacts of conventional farming and organic practices alleviate food safety worries over pesticide residues (Granatstein 2000; O'Rourke 2002; Belrose Inc. 2010b). Because of the price premium, a natural ceiling to the number of consumers willing to pay more for organic apples than for competing conventional apples exists (Dimitri and Oberholtzer 2009; Belrose Inc. 2010c). By 2008, organic orchards represented 5.7 percent of the U.S. apple acreage and 6.2 percent of total apple sales (Belrose Inc. 2010b; USDA NASS 2010a). Nonetheless, organics are a marketing alternative that have attracted growers because of the higher prices and the growersô own concerns over the environmental stewardship of their land (Rom and Ela 2005; Dimitri and Oberholtzer 2009).

Despite the price premium, few growers produce organic apples in the Shenandoah-Cumberland Valley Fruit District. In 2008, only 60 acres in Pennsylvania, or 0.3 percent of the stateôs total apple acreage was certified organic (USDA NASS 2008). Only four growers indicated on the mail survey that they were growing organic apples. Two of the farms were small, highly diversified organic operations with less than two acres of apples each. Another operator was in the midst of rehabbing an overgrown orchard and was not selling his apples commercially. His unsprayed apples were being used for hog feed (Source 1089 2010). Only one operation in the Fruit District had converted an average-sized conventional orchard to a certified organic orchard. Instead of committing to organics, many growers who sell directly to the public will provide

information and highlight their integrated pest management programs as evidence of their environmental stewardship.

Climate and costs are the main hindrances to growing organic apples in the Fruit District. The high pest and disease pressure caused by the regionôs humid climate increases the cost of production compared to conventional orchards (Vossen 1998; *Fruit Grower News* 2009b). Organic production requires more spray applications because the available sprays that are in compliance with organic protocols are less effective than chemical sprays. Organic sprays tend to wash off easily, are preventative rather than curative, and do not have residual activity. Organic orchards also tend to be more time-intensive for growers because of the frequency of the sprays and the closer scrutiny needed to monitor the orchard to maintain fruit quality (*Fruit Grower News* 2009b). Because the usual chemical thinning agents cannot be used, organic growers rely on labor-intensive hand thinning (Vossen 1998; Rom and Ela 2005). Other difficulties in organic production include weed and rodent control (Schotzko 2004). These challenges and the susceptibility of organic fruit to cosmetic blemishes have resulted in a national per acre crop yield that is 12 percent below conventionally grown apples (Belrose Inc. 2010b). Finally, the orchard must undertake a three-year certification process in order to qualify for USDA organic labeling. The transition costs can be substantial if converting an existing conventional orchard because the grower incurs the extra costs of organic production but the fruit does not earn the organic price premium until after certification is attained (Vossen 1998; Schotzko 2004; Dimitri and Oberholtzer 2009).

Sometimes the difficulties of organic production are too much to overcome. At least one large operation in the Fruit District was unsuccessful in its attempt to convert some of its apple acreage to organic. Other growers have made appropriate adaptations. To counter problems such as apple scab, the two small, diversified organic farms only plant disease-resistant apples, lessening the need for some sprays (Martin and Martin 2010). In addition, Penn State has had a long-term research project at its Biglersville (Adams County, PA) fruit station dedicated to improving organic practices in humid climates (White 2009). While organic is no longer deemed impossible in the eastern states, the expenses, time requirements, and challenging growing conditions will continue to prevent its adoption on a wider scale in the Fruit District.

Buy Local

Another current trend that is similar, but not necessarily congruent with, the organic movement is the ñbuy localò movement. ñBuy localò advertises the proximity of the place of production as a way to differentiate products and encourage sales. Often a point of emphasis is the linking of consumers to the producer by direct contact or by disseminating information about the farmer and his or her production practices (King *et al*. 2010; Martinez *et al.* 2010). One testament to the popularity of the buy local movement is the fact that the number of farmersô markets in the United States has exploded from 1,755 markets in 1994 to 6,132 in 2010 (USDA AMS 2010b).

Like the organic movement, part of the allure of buying local is the perceived promotion of sustainable production practices taking place on family farms combined with a backlash against industrial agriculture (O'Rourke 2009; King *et al*. 2010; Martinez

et al. 2010). Both organic and local food advocates tout food safety and environmental advantages, albeit from different angles. Whereas organic proponents emphasize the non-use of synthetic chemicals in the production process, ñbuy localò advocates stress the reduction of ñfood miles,ò the amount of energy and emissions used in the supply chain (O'Rourke 2009; Martinez *et al.* 2010). Shorter supply chains attract consumers who want produce grown for flavor and not for the fruitôs tolerance of long-distance shipping (Roth 1999; Tropp *et al.* 2008). Consumers value local foodsô freshness, variety, and the reassurances of knowing where their food was grown. Many people purchase local foods because it gives them the opportunity to help area farmers and to support the local economy (Burt *et al*. 2000; Smoot 2008b; Tropp *et al.* 2008; O'Rourke 2009; Martinez *et al.* 2010; Dearth 2011).

ñLocalò apples flow through several different distribution channels. The avenue most commonly associated with the ñbuy localò movement is direct marketing. Customers value interactions with the farmers that occur at on-the-farm retail stands and at farmersô markets (Tropp *et al.* 2008; Martinez *et al*. 2010). Another distribution network associated with the buy local movement is the short, intermediated supply chain. Apples in these supply chains are grown and sold in the local area but have an intermediary between the producer and the end consumer. This category includes growers that sell directly to supermarkets, school districts, and restaurants that feature locally-produced foods (Berube *et al*. 2006; Gomez *et al.* 2010; Martinez *et al*. 2010). Finally, apples that are sent to large packinghouses and flow through traditional distribution networks may be marketed as local produce at supermarkets if the

packinghouse is located in that region (Gomez *et al.* 2010). Whichever distribution network is used, it is the marketing of these apples as ñlocalò products using advertising or packaging that differentiates them from generic commodity apples (King *et al.* 2010; Martinez *et al*. 2010).

Historically, Washington-grown apples have dominated the higher-value, bulk bin displays in supermarkets, even in stores located in the Shenandoah-Cumberland Valley Fruit District (Gomez *et al.* 2010; Rice 2010). To help differentiate their apples from apples grown in Washington, Adams Countyôs (PA) Rice Fruit Company and other packinghouses will often market their apples as ñEastern Applesò on their bags and promotional materials (Rice 2010). The subscript of the ñEastern Appleò label says ñCrispier, Tastier, Juicier.ò This implies that while Washington apples have better coloring and may be more cosmetically appealing, eastern-grown apples provide the better eating experience. This label also implies ñlocalnessò even though the appellation ñeasternò may be applied to growing regions from New England to North Carolina.

According to one Pennsylvania packer, the emergence of the buy local movement has been one of the most important trends occurring in the fresh wholesale apple industry in the past 10 years. He stressed that people want their supermarket chains to sell local apples (Source 1103 2010). This public sentiment has helped the Fruit Districtôs packinghouses gain increased access to grocery store shelf space (Lehnert 2012c). Large retailers have embraced the ñbuy localò movement because their selection of local produce is just one more way to differentiate their stores from their competitors. Despite being large regional or national chains, featuring local foods helps the retailers to position

themselves as an areaôs ñlocalò grocer (Tropp *et al*. 2006; OôRourke 2009; Martinez *et al*. 2010). Sometimes the supermarkets will even specify that apples be packed in tote bags that connote a ñlocalò farm stand image (Gomez *et al.* 2010).

ñSurprisingly, the best supporter of local has been Wal-Mart,ò says John Rice, Vice President of the Rice Fruit Company packinghouse in Adams County (PA). Rice notes that Wal-Mart tries to be regionally correct when sourcing its produce. As a result, Rice Fruit ships heavily into Wal-Martôs Mid-Atlantic distribution centers. In 2006, Wal-Mart accounted for 22 percent of Riceôs business (Warner 2006; Rice 2010). The other major regional supermarket chain, Martins, has a ñLocal Routeò advertising push in the summer. In addition to its regular suppliers, during this promotion, Martinôs will source produce from local or in-state farms that would not otherwise have access to a store the size of Martins (Figure 5.4).

The potential opening provided by the ñbuy localò movement has not eliminated the challenges faced by small producers of selling to large supermarkets. Small producers may still be limited by their ability to supply the volume and variety required by even a single store. Standards demanded by customers mean that the growers must invest in postharvest handling needs such as refrigeration and packaging to ensure ñstore qualityò fruit. Many grocery stores also find coordinating small, frequent deliveries inefficient compared to ordering from their distribution center (Belrose Inc. 2008a; O'Rourke 2009; Gomez *et al*. 2010; Martinez *et al*. 2010).

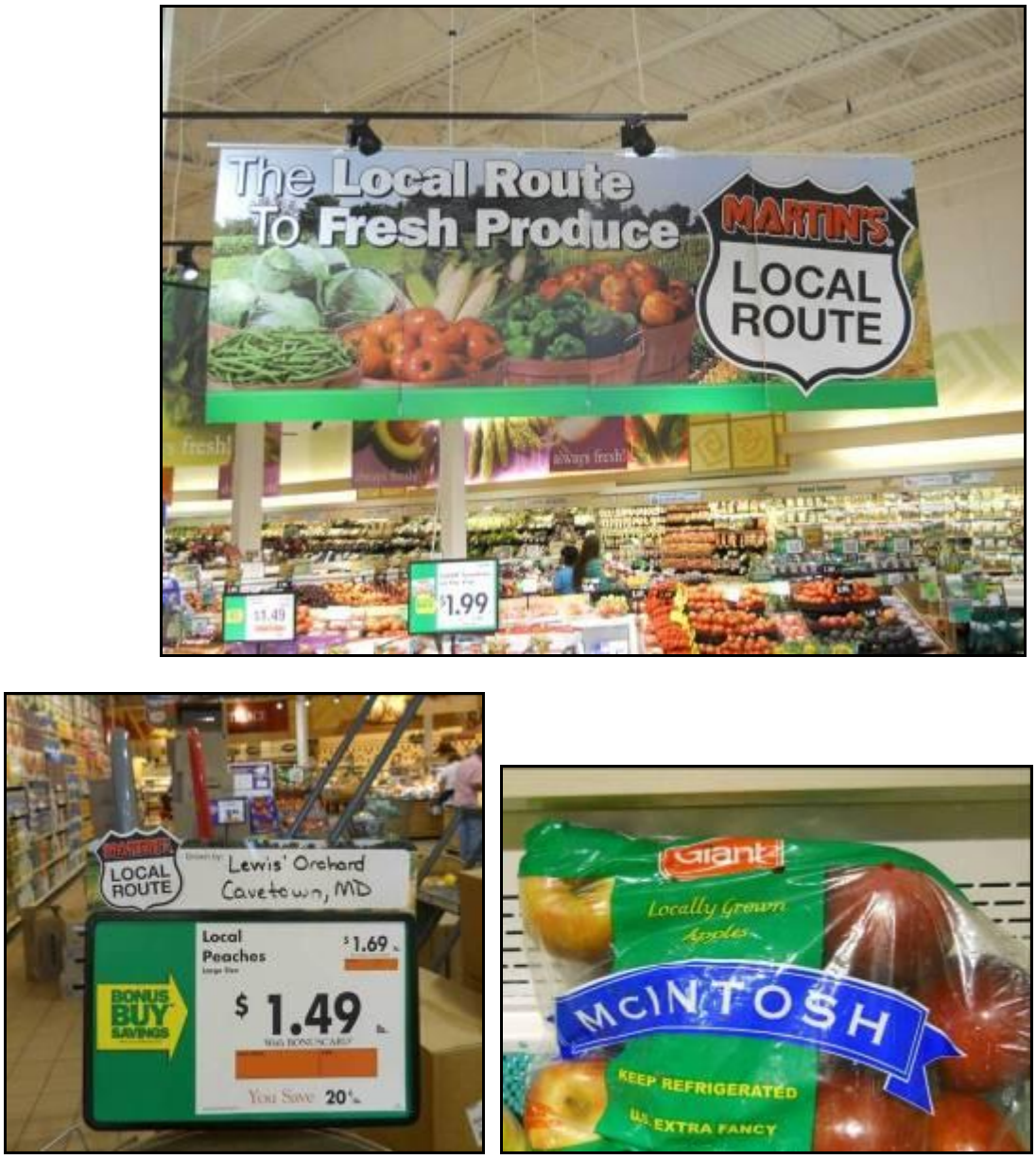


Figure 5.4 Supermarket Promotion of "Local" Fruit

Top ï The ñLocal Routeò promotional campaign at a Martinôs supermarket in Hagerstown, Washington Co. MD; *Bottom Left* ï The ñLocal Routeò campaign allots shelf space to a local apple and peach grower from Washington County, MD; *Bottom Right* ï Bagged apples labeled ñLocally Grown.ò Many packinghouses in the Fruit District will pack apples in a Giant or other retailer-labeled bag; Washington Co. MD

Photographs by Joseph P. Guttmann

Structural barriers also exist in getting more locally-produced apples into local schools and other school districts throughout a state. School cafeterias have historically relied on cheap, easy-to-prepare processed foods and fresh foods sourced nationally through large food distributorships (Rowles *et al*. 2001). A school district is going to get whichever apple the wholesaler found for the cheapest price (Glaize 2010a). In Virginia, schools have traditionally served Washington apples because those apples were cheaper (Kremer 2006). The owner of a Winchester (VA) packinghouse has said that the general distribution patterns and pricing needs have made it very difficult to get more Virginia apples into Virginia schools (Glaize 2010a).

Representing a conjoining of the buy local movement and the anti-childhood-obesity campaign, some states have passed Farm-to-School initiatives with the purpose of bringing more local, fresh foods into school cafeterias. In addition to the provision of healthier school meals, the programs are also viewed as a way to boost a stateôs agricultural economy (Bendfeldt 2010; Dimitri *et al*. 2010). Maryland (2008) and Virginia (2010) have passed legislation establishing a Homegrown School Week where for one week each year, statewide schools feature foods grown in that state (Bendfeldt 2010; Dimitri *et al.* 2010; Semler 2010; Hanson 2011). Another goal of the Homegrown School Week is that it will serve as the impetus for the further development of sales throughout the year between in-state growers and statewide school districts. Virginia even provides a website that lists school districts that want to buy Virginia-grown food with farmers wanting to sell to school districts (VDACS 2012).

Apples are well positioned to take advantage of the Farm-to-School programs because whole apples can be served raw with little to no food preparation. Because small apples are more appropriate size for children, school foodservice also provides a potential market outlet for smaller apples that otherwise might be difficult to sell on the wholesale or direct-to-consumer markets (Gomez *et al*. 2010; Neal 2010). Some growers in the Shenandoah-Cumberland Valley Fruit District have been supplying local school districts with fruit for years (Semler 2010). For other growers, the Farm-to-School program has enabled them to get a foot in the door. For example, Catoctin Mountain Orchard of Thurmont (Frederick County, MD) began selling apples and plums to the Frederick County, Maryland school district once the program started (Neal 2010).

Even though some barriers remain, the buy local movement has helped growers and packers in the Fruit District to increase their sales to supermarkets and school districts. In addition, growers from the Fruit District are well positioned to take advantage of the increasing number farmersô markets being held in the nearby Washington-Baltimore metropolitan area. The buy local movement creates a stronger demand for local apples in the short intermediated supply chain, direct marketing, and traditional distribution channels. By increasing the percentage of apples that can earn higher returns than the apples would for processing purposes, the continued popularity of the buy local movement enhances the long-term viability of the Shenandoah-Cumberland Valley Fruit District.

Competing U.S. Apple-Growing Regions

Todayôs apple production is highly concentrated in several regions that combine natural advantages with the necessary industry infrastructure. While apples are grown commercially in most regions outside the Great Plains and lowland South, only four states accounted for 85.1 percent of the nationôs total apple crop in 2009 (Table 5.7) (USDA NASS 2010c). Major concentrations of apple production include the Yakima Valley, Wenatchee, and Columbia Basin districts of central Washington, the Lake Michigan Fruit Belt, Western New York Fruit Belt, and the Mid-Atlanticôs Shenandoah-Cumberland Valley Fruit District.

Table 5.7 Top Six States — Apple Acreage, Production, and Yield

State	Apple Acreage 2009	Percentage of National Apple Acreage	Average Utilized Production 2007-2009 (million lbs)	Percentage of Average National Total Production	Average Yield per Acre (lbs)
Washington	153,000	44.0%	5,416.7	57.4%	35,400
New York	42,000	12.1%	1,300.0	13.8%	31,433
Michigan	38,000	10.9%	803.3	8.5%	22,533
Pennsylvania	21,000	6.0%	473.3	4.9%	22,633
California	19,000	5.5%	323.3	3.4%	16,400
Virginia	11,800	3.4%	228.7	2.4%	19,167
United States	**347,800**		**9431.0**		

Source: USDA, NASS *Noncitrus Fruits and Nuts 2009 Summary*

Each region has unique circumstances that impact its place and competitiveness in the national market. Regional differences include the amount of apples produced and the percentages being sold in each market outlet (Tables 5.8 and 5.9). Prices received, varieties grown, and various costs such as transporting the apples to market also vary by region. A regionôs yield per acre is affected by the natural environment and the rate that progressive production practices are adopted by its growers. Finally, regions are experiencing varying rates of population growth, which combined with other macro trends in the industry, influences gains and losses of apple acreage.

Table 5.8 Average Fresh Market Production by State, 2007–2009

State	Utilized Production (million lbs.)	Percentage of the State's Production	Percentage of National Production	Price per Pound (cents)
Washington	4433.3	81.8%	70.9%	32.9
New York	638.3	49.1%	10.2%	29.3
Michigan	276.7	34.4%	4.4%	28.7
Pennsylvania	155.7	33.8%	2.5%	27.7
California	141.7	43.8%	2.3%	46.6
New England	121.5	75.1%	1.9%	52.9
Virginia	49.3	21.6%	0.8%	31.0
North Carolina	45.8	33.9%	0.7%	27.5
West Virginia	16.7	21.1%	0.3%	25.2

Note: New England = Combined production of CT, MA, ME, NH, and VT

Source: USDA, NASS *Noncitrus Fruits and Nuts 2009 Summary*

Table 5.9 Average Processing Market Production by State, 2007–2009

State	Utilized Production (million lbs.)	Percentage of the State's Production	Percentage of National Production	Price Per Pound (cents)
Washington	983.3	18.2%	30.9%	6.1
New York	661.7	50.9%	20.8%	10.0
Michigan	526.7	65.6%	16.6%	10.5
Pennsylvania	304.3	66.2%	9.6%	9.1
California	181.7	56.2%	5.7%	11.4
Virginia	179.3	78.4%	5.6%	9.5
North Carolina	89.3	66.1%	2.7%	9.5
West Virginia	62.3	78.9%	2.0%	9.1
New England	40.2	24.9%	1.3%	10.0

Note: New England = Combined production of CT, MA, ME, NH, and VT

Source: USDA, NASS *Noncitrus Fruits and Nuts 2009 Summary*

Washington

With a 57.4 percent share of the total utilized output, the state of Washington dominates national apple production (Table 5.7). Located in the rain shadow of the Cascade Mountains, central Washingtonôs sunny days, cool nights, and dry atmosphere provides an ideal apple-growing climate when irrigated. Compared to the humid climates in the East, pest and disease pressure is much lower in Washington (Jarosz and Qazi 2000; *Fruit Grower News* 2009b). The limited rainfall leaves the trees less susceptible to diseases such as fire blight. Less moisture on leaves and fruit also produces a nice, smooth skin (Marini 2010; Wenk 2010). Whereas a typical orchard in the East might need to be sprayed 12 times a year, Washington orchards can get by with half that amount, saving money on the associated costs (Miller 2010). The naturally lower disease and pest pressure is a major reason why the state produces 87 percent of the national organic apple crop (Belrose Inc. 2010b).

As a result of its climate, Washington has benefited from its ability to consistently produce intensely-colored, unblemished fruit that consumers find visually appealing (Nagurny 2002; Schotzko 2004). This reputation for producing attractive fruit has been reinforced by the place-based promotional campaign of the Washington Apple Commission (WAC). Specifically, the WAC has created the iconic imagery of the Washington Red Delicious as the perfect apple, setting a standard that other apple regions found difficult to replicate (Jarosz and Qazi 2000; Marini 2010).

In addition to apples, Washington is the nationôs leading producer of pears and sweet cherries (USDA NASS 2010c). The growing of other fruit is important because it allows growers and packers to diversify their product mix. It also enables packinghouses to increase the scale of their operation or use warehouse capacity more efficiently (O'Rourke 1994; Gomez *et al*. 2010). The state-of-the-art packinghouses are unrivaled in terms of the volume of apples handled (Marini 2010). At least a dozen of Washingtonôs packinghouses can handle several times the fruit handled at the largest packinghouse in the eastern United States (Rice 2010). The larger the packinghouse, the easier it is to fill large orders at specific grades. This increases the likelihood of obtaining national supermarket accounts because it is simpler for buyers to deal with a few large packers than many small packers (Marini 2010). The efficient handling of large quantities of apples and other fruit also lowers per unit costs, increasing the overall competitiveness of the packinghouse (O'Rourke 1994; Gomez *et al*. 2010).

Washingtonôs main disadvantage has always been its distance to market. One effect of this distance was the development of a more cooperative spirit and a willingness

to adopt new methods in order to overcome this disadvantage. This is in contrast to growers in the eastern states who were historically known for their individualism and conservative outlook on risk-taking (Folger and Thomson 1921; Miller 2010). For example, to promote apple size, Washington growers practiced the hand thinning of apple blossoms many years before the rest of the country followed suit. Likewise, a standardization of quality was obtained through the stringent grading of fruit, a practice fraught with early inconsistencies elsewhere (Folger and Thomson 1921). Today, Washington Extra Fancy and Washington Fancy apples still must meet higher standards for coloring and sugar levels than their respective national counterparts, U.S. Extra Fancy and U.S. Fancy (Boland *et al*. 2007; WAC 2010d). Washington growers self-imposed a mandatory grower tax to fund the WACôs national promotional campaign and the growers also formed packing and marketing cooperatives (Sonnenfeld *et al*. 1998; Jarosz and Qazi 2000; Wilmot *et al*. 2008; Warner 2012a). More recently, progressive Washington growers have been at the forefront of high-density plantings. Combined with the ideal climatic conditions, the high-density plantings have resulted in the highest average yields per acre in the nation (Table 5.7).

The efficiencies created by the high yields per acre, lower spray costs, and the high volumes handled at the packinghouses lowers the cost per unit enough to compensate for the transportation by trucks to distant markets. For example, in a case study by Gomez *et al*. (2010) on the Syracuse (NY) apple market, Washingtonôs shipping point price was generally 10ï 30 percent less than New Yorkôs shipping point price. With transportation costs equaling 12 percent of the final retail price for Washington apples

and two percent for New York-grown apples, the lower production costs allow Washington apples to remain competitive in the Syracuse market despite the 2,600 mile distance separation. However, this price competitiveness can be undercut to a degree with steep rises in the fuel price (*Fruit Grower News* 2005).

Competitive pricing and the sheer volume of high-grade, attractive fruit has enabled Washington apples to dominate the national fresh market with a 70.9 percent share (Table 5.8). Washington has a strong advantage in grocery store bulk bin sales. Bulk bins are displays where customers buy the fruit by the piece and pay by the pound. Bulk bin apples command higher prices, earning a higher return for the packer and retailer. This arrangement favors Washington because retail stores sell 70ï 80 percent of their apples from bulk bin displays (Bentley 2010; Gomez *et al*. 2010; Rice 2010; Offner 2011a). Washington leads the nation with an average of 81.8 percent of its crop being sold on the fresh market (Table 5.8). Aided by the promotional efforts of the WAC, about 30 percent of the fresh output is exported. Washington accounts for approximately 85 percent of all exported apples from the United States (Lynch 2010; WAC 2010a).

Washington growers aim their production at the fresh market. But, because of the size of the industry, Washington also produces the greatest number of apples used in processed products. The Washington processing market exists for the growers seeking residual value from the 18.2 percent of apples that did not make the grade for the fresh market (Table 5.9) (Schotzko 2004; Pollack *et al*. 2010). From 2004ï 2006, 67.5 percent of Washingtonôs processing apples were pressed for juice or cider (USDA NASS 2010c). This accounted for 53.1 percent of all juice apples in the United States (Table 5.10).

Washington is also a leader in dried apples and fresh-cut slices (Brushett and Lacasse 2006; Boland *et al*. 2007). One area where Washington is not a leader is in the canned apple category. Although its canned production is not inconsequential, Washington only accounts for 13.1 percent of the national output (Table 5.11).

Historically, Washington processing prices have been lower than other apple-growing districts (Table 5.9). This is partly because Michigan and East Coast processors set a price with growers early in the harvest season whereas Washington processors mostly pay a by-product price to the wholesale packinghouses for their culls (Rowles 2001a; Schotzko 2004; Guise 2010). The predominance of low-priced juice apples versus higher-priced peeler apples for canning also lowers Washingtonôs average processing price compared to other apple-growing regions. Often times, Washington processing prices do not even cover variable costs (O'Rourke 1994; Schotzko 2004). For example, juice prices have been particularly low, averaging only two cents per pound some years (Table 5.10). In fact, one East Coast processor noted that in some years Washington processing prices are so low that that it is cheaper to ship Washington-grown apples cross-country than to buy from local growers (Rowles 2001a; Guise 2010). The grower-owned Tree Top cooperative regularly uses 50ï 60 percent of Washingtonôs processing apples and the cooperative is the largest producer of fresh-pressed apple juice in the United States (Boland *et al.* 2007; Wilhelm 2010).

Table 5.10 Apples Utilized for Juice or Cider Production by State, 2004–2006

State	Apples Used for Juice (Million Lbs.)	Percentage of State's Total Apple Production	Percentage of National Juice Production	Average Price Per Pound (Cents)
Washington	933.3	16.0	53.1	2.0
New York	186.7	15.7	10.6	4.9
Michigan	148.3	19.3	8.4	5.5
Pennsylvania	70.3	15.8	4.0	4.8
Virginia	36.0	14.2	2.0	4.9
North Carolina	20.7	14.8	1.1	5.5
West Virginia	17.3	20.7	1.0	5.3
United States	**1,757.3**			**3.9**

Note: California produced an average of 175 million pounds for juice 2004-2006

Source: USDA, NASS *Noncitrus Fruits and Nuts 2007 Summary*

Table 5.11 Apples Utilized for Applesauce or Other Canned Production, 2004–2006

State	Apples Used for Canned Production (Million Lbs.)	Percentage of State's Total Apple Production	Percentage of National Canned Production	Average Price Per Pound (Cents)
New York	310.0	26.0	25.9	8.1
Pennsylvania	251.7	54.9	21.1	8.1
Michigan	208.3	26.7	17.4	8.9
Washington	156.7	2.7	13.1	4.1
Virginia	124.3	48.4	10.4	7.6
North Carolina	55.3	36.2	4.6	8.3
West Virginia	46.0	53.5	3.8	7.7
United States	**1195.0**			**7.6**

Source: USDA, NASS *Noncitrus Fruits and Nuts 2007 Summary*

New York

New York is a distant second place to Washington in terms of acreage and production (Table 5.7). Located along the south shore of Lake Ontario, the Western New York Fruit Belt is the top apple-producing region in the state (Table 5.12). A secondary apple district with less than 10,000 acres is in the Hudson Valley. Despite having two major population centers, Niagara Falls and Rochester, population growth in the Western New York Fruit Belt has been a tepid 4.2 percent since 1980 (U.S. Census Bureau 2007, 2011). This is in contrast to many apple-growing regions in the eastern United States that have been rapidly gaining population (Table 5.12). While growers in low-growth areas face many of the same macro-level concerns as the rest of the apple industry, the option of selling out may not be as viable or lucrative without a strong demand for developable land. This may be a reason why the apple acreage in the Western New York Fruit Belt has declined by only 22.2 percent since 1982, a slower rate than many other eastern apple districts (Table 5.12).

Table 5.12 Apple Acreage and Population Change in Select Eastern Apple Districts

Apple District	1982 Apple Acreage	2007 Apple Acreage	Change in Apple Acreage 1982–2007	2010 Population	Population Growth 1980-2010
Western New York	39,303	30,568	ï 22.2%	1,097,368	4.2%
Hudson Valley (NY)	25,317	9,951	ï 60.7%	915,890	26.8%
Lake Michigan (MI)	57,157	36,913	ï 35.4%	1,753,975	28.3%
Henderson County (NC)	10,502	5,660	ï 46.1%	106,740	82.2%
Shenandoah-Cumberland Valley	58,401	29,342	ï 49.8%	1,118,796	50.2%

Source: USDA NASS *Census of Agriculture*; U.S. Census Bureau

New Yorkôs ratio of fresh market apples versus those used for processing is split 50ï 50 (Table 5.8; Table 5.9). One advantage for its fresh market fruit is its accessibility to the large East Coast markets. New York growers have also differentiated their product by catering to regional tastes and growing a different varietal mix than their Washington counterparts. The two most widely grown apple varieties in New York are the McIntosh and Empire (USDA NASS 2007b). Another major asset to the New York apple industry is Cornell University, one of the premiere non-citrus fruit research institutions. Many growers have adapted progressive tree care methods, such as the tall spindle trellis, that have helped the state to have the second highest average yield per acre in the United States (Table 5.7) (Lehnert 2010e). New York also has a strong direct marketing base

with many farm stands and farmersô markets that offer growers higher returns on their fruit. On the down side, the state has many small packinghouses that do not have the volume and cost efficiencies of the Washington packinghouses (Gomez *et al.* 2010).

New Yorkôs fresh market opportunities are complemented by a strong processing sector (Table 5.9). In the past three years, 75.7 percent of New York-grown processing apples are used in New York processing plants. The remaining New York-grown processing apples are bought by out-of-state processors (Rowles 2001b; USDA NASS 2010b). New York leads the nation with a 25.9 percent share of the canned apple market and ranks second in juice/cider and frozen apple production (Table 5.10; Table 5.11). New Yorkôs largest apple processor, Mottôs, is the market leader for branded retail applesauce and apple juice (Guise 2010).

In 1999, morale among many of the larger processors in the Northeast that use New York apples was quite low (Rowles 2001a). Out of 14 processors interviewed, 12 expressed a negative or neutral outlook on the future of the Northeastern processing industry. Many were concerned about stiff price competition, food industry consolidation, and foreign apple juice concentrate. New York processors specifically groused about the electric rates that are substantially higher than in other parts of the country. This especially impacts controlled atmosphere and regular cold storage costs. High state taxes were also mentioned as a negative.

Michigan

Running the length of the eastern shore of Lake Michigan from the Traverse City (MI) area south to the Indiana border is the Lake Michigan Fruit Belt. Westerly winds moderated by the air passing over Lake Michigan produce low daily temperature fluctuations, low frost danger, and a late spring, ideal for apples and Michiganôs most famous fruit, cherries (Folger and Thomson 1921; Pillsbury and Florin 1996; Che 2006). Apple acreage in the Michigan Fruit Belt was actually increasing until it hit a peak in 1992. Since 1992, apple acreage has declined by 42.7 percent, though the trend may soon plateau (USDA NASS 2009a). In a 2008 survey by the Michigan Apple Committee, 42 percent of growers expected to increase their acreage in the next five years while another 40 percent expected their acreage to hold steady (Yockey 2008).

The highest concentration of apple acreage is located on Fruit Ridge north of Grand Rapids (MI). Typical of many areas on the rural-urban fringe, the Fruit Ridge has experienced development pressures from people moving from Grand Rapids to more rural locales (Che *et al.* 2005b; Jackson-Smith *et al*. 2008; Lehnert 2010f). The cluster of counties with the second highest amount of apple acreage is located in Michiganôs southwestern corner near the Indiana border. Interestingly and seemingly counter-intuitively, this area of slow to negative population growth has lost a higher percentage of its apples than the Grand Rapids area (USDA NASS 2009a).

As a state, Michigan ranks behind New York in acreage and production (Table 5.7). The stateôs average yield per acre is just two-thirds of Washingtonôs One reason for the lower yields is that only 34.4 percent of Michiganôs output is sold on the fresh

market (Table 5.8). In terms of average yields and the percentage of apples going to the processing market, Michigan is very similar to Pennsylvania. Like Pennsylvania, growers are trying to shift more of their apple production into the fresh market. In 2008, 53 percent of Michigan growers indicated that they intended to increase their focus on fresh apples (Yockey 2008). Results of this shift can be seen in the noted increase of high-density plantings that use trellising on Fruit Ridge (Lehnert 2010f).

Michigan has a strong, well-rounded processing sector. Consuming 65.6 percent of its apple output, Michigan ranks number three in the nation in canned apple production, number four in apple juice, and produces over one-half of the nationôs frozen apples (Table 5.9; Table 5.10; Table 5.11). The processing sector has a unique set-up in that, by law, the Michigan Processing Apple Growers Division of the Michigan Agricultural Cooperative Marketing Association (MACMA), a voluntary association representing 700 processing growers, annually negotiates minimum apple prices with the processors. This extra bargaining leverage has enabled Michigan growers to receive higher average prices for their processing crop than growers in the eastern states and the Pacific Northwest (Table 5.9) (Rowles 2001b; MACMA 2008). Michigan growers sell to a variety of processors including the Paw Paw (MI) branch plant of the Adams County (PA)-based Knouse Foods (Knouse Foods 2010). Another processor from the Shenandoah-Cumberland Valley Fruit District, Winchesterôs (VA) National Fruit Product Company, sold its Kent City (MI) branch plant in 1998. National Fruit had operated the facility for nearly 40 years (NFPC 2010).

Other Districts

Located in the Asheville Basin of the Blue Ridge Mountains, North Carolinaôs Henderson County is a compact apple district of 5,660 acres. This acreage is down 46.1 percent since 1982 (Table 5.12). At the same time, population has increased by 82.2 percent to 106,740. Much of this growth has historically, and continues to be, amenity-driven as the pleasant climate and mountain views have attracted second home owners, retirees, and those seeking outdoor recreational activities. Similar to the situation on the rural-urban fringe, outsiders with greater means can bid up the price of land putting pressure on agricultural land (Shumway and Otterstrom 2001).

Two-thirds of North Carolinaôs apples are used for processing (Table 5.9). At one time, Seneca, Gerber, and National Fruit had apple processing facilities in the area. Lower regional raw fruit output and corporate restructuring induced all three companies to leave the area in the late 1990s. Today, the bulk of the districtôs processing apples are sent to National Fruit and Knouse Foods facilities located in the Shenandoah-Cumberland Valley Fruit District (Owings 2007). Processors located outside the region value the earlier harvest dates of Henderson Countyôs apples (Rowles 2001a). In the fresh market, the countyôs packinghouses are competitive in the southeastern states.

Unlike the compactness of Henderson County, New England has very dispersed orchards. Only two counties, Worcester County in Massachusetts and Addison County near Lake Champlain in Vermont, have more than 1,000 acres in apples (USDA NASS 2009b). Due to the dispersed nature of the orchards and small size of the states, the growers from the six states have unified to fund the New England Apple Association, a

promotional organization (NEAA 2008). New Englandôs primary focus is on the fresh market as 75 percent of its apples reach consumers in this manner (Table 5.8). New Englandôs seven small and medium-sized packinghouses benefit from being close to Boston, other large regional population centers, and New York City (NEAA 2011b). New Englandôs real strength is in direct marketing. The importance of direct marketing to the overall state of the New England apple industry is reflected in the high average fresh prices received by the growers (Table 5.8). Out of the 110 orchards listed on the New England Apple Associationôs website, 98 orchards had either a farm stand or a pick-your-own operation (NEAA 2011a). Many people take drives to look at the colorful New England foliage and stopping at farm stands to buy apples and cider, or pick-their-own apples is an integral part of the autumn experience.

Foreign Trade

As the worldôs second largest apple producer, the United States plays a prominent role in the world apple trade (Belrose Inc. 2010c). The United States exports more fresh apples than it imports but has a severe trade deficit in processed apple products (USDA ERS 2010a). As with most agricultural commodities, the presence of tariff and non-tariff barriers inhibit the free flow of trade (O'Rourke 1994). Tariff rates for exported U.S. apples range from Canada allowing duty-free entry to the 50ï 60 percent rates levied by India and Turkey (Deodhar *et al*. 2006; Lynch 2010). Phytosanitary restrictions are the most common non-tariff barriers. These restrictions are designed to protect a countryôs orchards from the introduction of pests and diseases by requiring the exporting country to adhere to certain growing, handling, and storage protocols. Other restrictions include

maximum allowable pesticide residue levels and labeling requirements that are aimed at consumer protection. Phytosanitary restrictions can effectively exclude all fresh apple imports from certain countries (Lynch 2010). Non-tariff barriers can be used to protect a domestic apple industry from foreign competition because, like tariffs, complying with regulations often raises the costs of doing business for the exporters (O'Rourke 1994). For example, after the World Trade Organization ruled that Japanôs fire blight protocols were judged not to be scientifically-based, Japanôs revised regulations were still so expensive to implement that U.S. growers have chosen not to export to that market (Calvin and Krissoff 2005; Lynch 2010). Currently, the United States does not have duties on imported fresh apples, but because of its phytosanitary standards, only 19 countries are permitted access to the U.S. market (Lynch 2010).

Trade depends on the competiveness of a regionôs supply chain and if the price and quality standards meet the consumer demand (Ricks *et al*. 2000). The annual ñMajor Apple Producing Country Competitiveness Rankingsò released in Belrose Inc.ôs (2010c) ñWorld Apple Reviewò ranks countries according to their production efficiencies, quality of the apple industry infrastructure, and financial and market factors. In 2010, the United States placed second overall, up from sixth place in 2006. Chile held the top spot in both years. Rounding out the top five in 2010 were Italy, France, and New Zealand. The United States scores well in infrastructure but lags behind many top producers in production efficiencies (Belrose Inc. 2006b, 2010c). The state of Washingtonôs production efficiencies would rank at or near the top of the world rankings but the United

States production averages are brought down by some of its less efficient regions (O'Rourke 2001; 2002).

Imports

In 2009, only 7.1 percent of the fresh apples consumed in the United States were imported from other countries. Apple imports are primarily from the southern hemisphere and are mostly available in the United States from March to August (Lynch 2010; USDA ERS 2010a). These counter-seasonal imports supplement declining domestic stocks but also compete with domestic apples coming out of controlled atmosphere storage and early season apples from California and North Carolina (Hornick 2011a). To use their capacity during the off-season, large American packinghouses will often import, store, and repack apples from the southern hemisphere (Warner 2006; Gomez *et al.* 2010; Rice Fruit Co. 2010b; NYAS 2011; Lehnert 2012a). Canada is the exception to the counter-seasonal trend with a 13.5 percent share of the import market (USDA ERS 2010a).

Chile has been the largest exporter of apples to the U.S. since 2001 when it surpassed New Zealand and Canada. In 2009, Chile accounted for 56.2 percent of U.S. imports followed by New Zealandôs 28.6 percentage share (USDA ERS 2010a, 2010b). Ranked as having the most competitive apple industry, Chileôs advantage is its high productivity, low costs, and ideal climate (Belrose Inc. 2010c; Lynch 2010).

In 2009, Argentina, Brazil, and Chile combined to supply 17 percent of the imported apple juice concentrate to the U.S. market (USDA ERS 2010a, 2010b). At one time, Argentina had one-third of the U.S. market for imported concentrate. Multiple

economic crises at home combined with competition from China have led to a loss in Argentinaôs market share. Canada, Turkey, and South Africa also export some concentrate to the United States (Belrose Inc. 2006b; Lucier *et al*. 2006; Pollack *et al*. 2010; USDA ERS 2010b). While these countries contribute to the supplies of apple juice concentrate in the United States, it was the entrance of China into this market that has had the most impact.

China

In 1990, Chinaôs apple production was almost equal with that of the United States (Belrose Inc. 2006b). Since then, government assistance and market reforms have allowed farmers to have more freedom in their planting decisions (Huang and Gale 2006; Gale *et al*. 2010). Chinaôs apple production has exploded and the country now dominates world production. By 2008, China accounted for 42.9 percent of the worldôs production while the United States, still the worldôs second largest producer of apples, had a 6.4 percent share (Belrose Inc. 2010c).

Although it is by far the worldôs largest producer of apples, China only ranks seventeenth in the competitiveness rankings (Belrose Inc. 2010c). At this point in the apple industryôs development, China is known more for the quantity of apples produced than their quality (*Good Fruit Grower* 2010b). The average Chinese apple orchard is less than two acres in size and very labor-intensive. The trees are hand thinned and the apples are individually bagged while on the tree to prevent weather and pest damage (Schotzko 2004; Warner 2005a, 2005b; Hoying *et al.* 2006; *Good Fruit Grower* 2010). Many of the latest pesticides and fungicides are available, but their application modes are often

outdated (Warner 2005b). The average yield per acre is one-half that of the United States. China is also overly reliant on one variety, the Fuji, which accounts for over 60 percent of its production (Hoying *et al*. 2006; Belrose Inc. 2010c; Lynch 2010). While production costs are low, Chinaôs apple infrastructure and distribution systems are poorly developed. The lack of refrigerated storage and proper handling can lead to wastage rates as high as 25 percent (Warner 2005a).

Although most Chinese apples are sold fresh in their domestic market, the apple juice concentrate industry developed as an outlet for small, misshapen, and fallen apples (Belrose Inc. 2010c; Gale *et al*. 2010). It is the exportation of this concentrate to the United States that has been Chinaôs greatest challenge to the U.S. apple industry. In 1995, China accounted for two million gallons and less than 1 percent of the U.S. apple juice market (USDA ERS 2010b). With the goal of establishing market share and earning foreign currency, the Chinese priced their product far below world market prices and began the large-scale exportation of apple juice concentrate to the United States and other countries (Lehnert 2007b). By 1998, China accounted for 49 million gallons of apple juice and an 18.5 percent share of the U.S. market. Other countries also lowered their prices but Chinaôs concentrate was still priced 22 percent lower than the other importers (Belrose Inc. 2006b).

While U.S. apple processors had experienced difficulties competing against imported low-cost apple juice concentrate for years, the threat caused by the growing volume of extremely low-priced concentrate from China spurred a coordinated response from the apple industry. In 1999, the U.S. Apple Association, along with a coalition that

included Tree Top, Bowman Apple, National Fruit, and Knouse Fruit, filed an anti-dumping petition with the United States International Trade Commission. Tariff rates as high as 52 percent were placed on several Chinese companies with lower rates on others. The importation of Chinese concentrate dropped the following year but other Chinese companies with lower tariff rates increased their market share (O'Rourke 1994; Rowles 2001b; van Voorthuizen *et al*. 2001; Steward 2008). An appeal by China in 2003 exempted six out of the ten companies that appealed the punitive tariff and lowered the tariff rates for most other Chinese apple juice concentrate exporters. The tariff was finally removed in 2010 (Siyu and Xiao 2010). The tariff had been largely ineffectual as the Chinese continued to export concentrate at prices lower than other countries and lower than the price of production in the United States. By 2009, China accounted for 451 million gallons and 83.2 percent of the import market (USDA ERS 2010a).

The entrance of cheap Chinese concentrate effectively lowered the price floor for all processing apples. Apples that were previously used for juice no longer had a market and the glut of excess fruit pulled the pricing structure down (O'Rourke 2002; Kane 2008; Guise 2010). While the fresh price of apples gradually rose over the past decade, processing prices stagnated until the end of the decade (Table 5.6). Because of the ease of the substitutability of concentrate for raw apples, juice apple prices have remained low during this period instead of experiencing the price volatility of a typical commodity market (Rowles 2001b; Lehnert 2007b). Some apple processors that fresh-press their apples have de-emphasized their juice production because of the difficulties in competing

with bottlers that use only concentrates (Guise 2010). Since 2001, six U.S. plants that produced apple juice concentrate have been closed (Steward 2008).

Foreign apple juice now accounts for 83.9 percent of the apple juice consumed in the United States. This is up from 53.7 percent in 1995 (USDA ERS 2010a). In absolute terms, apple juice from U.S.-grown apples has declined 43.6 percent and imported juice from countries other than China has declined 49 percent since 1995 (USDA ERS 2010a, 2010b). Despite displacing both domestic juice and imported juice from other countries, Chinaôs low-cost presence in the market has helped expand the overall apple juice supply (Gale *et al*. 2010). Per capita consumption of apple juice is up almost 20 percent since 1996 (Table 5.6).

Because of the upheaval caused by the arrival of China in the apple juice market, other sectors of the U.S. apple industry have been wary of Chinaôs entrance into their markets (Hefling 2007; Guise 2010; Rice 2010; Lynch 2010). Until 1994, imports of canned apples, including purees, accounted for less than 1 percent of the total canned market. In the last two years, the imported average has crept up to 10.5 percent (USDA ERS 2010a). Chinaôs percentage of canned imports has risen from 10 percent in 2002 to 28 percent in 2009 (USDA ERS 2010b). While China has not been able to produce a quality applesauce because of its heavy reliance on the Fuji variety, Chinese apples are being used in Doleôs Diced Apple cups (Guise 2010). China has also been making inroads in the dried apple market (Rowles 2001a; USDA ERS 2010b).

The Chinese have been trying to enter the U.S. fresh market since 1998, but are still prohibited from entering the United States because of phytosanitary concerns. The

United States government has only recently released a revised list of pests and diseases that will require China to develop mitigation action plans and thus prevent their introduction into the United States. Aided by the lobbying efforts of the U.S. Apple Association, the United States trade delegation had been delaying the listôs release for years. The opening of the U.S. market for fresh apples from China is, therefore, still years away. Verifying compliance with protocols on the millions of small micro-farms in China will prove difficult and the recent destructiveness of the Asian brown marmorated stink bug will cause the United States to exercise extra caution (U.S. Apple Association 2010a). China does have access to the Canadian and Mexican fresh markets but has yet to win much market share. If China does gain access to the U.S. market, their Fuji apples will be much cheaper than domestically grown Fujiôs (Rice 2010). Like apple juice concentrate, the worry is that the Chinese Fuji could wreck the price floor, lowering prices for all apples.

Export

Apples are now the number one most valuable fresh fruit export, ahead of grapes and oranges (Perez 2012b). Over the past five years, the United States has exported an average of 16.5 percent of its annual apple output. This is up from an average of 6.1 percent of the total crop exported in the mid-to-late 1980s (USDA ERS 2010a). This growth in export trade was partially due to an increase in fresh market production without a corresponding rise in domestic fresh apple consumption (Table 5.6). Even though Washington supplies 85 percent of the exports, fresh market exports are vital to the entire health of the apple industry in the United States (Schotzko 2004; Pollack and Perez 2005;

Lynch 2010). By soaking up excess production, exports improve overall grower returns (Fryhover 2010). Conversely, if trading relationships break down or if there is an economic crisis, the apples intended for export are sent to the domestic market, depressing grower prices in all districts (Edwards 2004; Pollack and Perez 2005).

The United Statesô NAFTA partners, Mexico and Canada, account for 43 percent of the apple export trade (USDA ERS 2010a, 2010b). Despite the NAFTA treaty, the United States and Mexico have had a testy trade relationship. Starting in 1996, Mexico accused the United States of dumping Red and Golden Delicious apples on the Mexican market and it responded by levying high import duties against specific export companies from the Pacific Northwest. As this dispute was ending in 2010, a new row erupted when the U.S. reneged on a deal allowing Mexican trucks access into the United States. Mexico retaliated by initiating a 20 percent levy on all apples imported from the United States. Any unnecessary disruption to trade with Mexico hurts U.S. growers since Mexico is the most important export market (Lynch 2010; Milkovich 2010b).

The United Statesô second most important region of trade is Asia, with Taiwan, Hong Kong, Indonesia, India, Thailand, and Malaysia being important markets (Lynch 2010). Like Mexico, the population and income of these countries has been rising, creating a demand for high quality apples (O'Rourke 1998; Lynch 2010). As China has increased its apple exports, it has proven to be a formidable competitor with the United States in Southeast and South Asia. Lower production and shipping costs has enabled China to take market share from U.S. exporters in places like Indonesia and Malaysia (Schotzko 2004; Deodhar *et al*. 2006; Huang and Gale 2006; Lucier *et al*. 2006). While

the Chinese apples are very competitive in price, they are generally of lower quality than U.S.-grown apples. Consequently, the Chinese have had difficulties penetrating the affluent export markets with more discriminating consumers (*Good Fruit Grower* 2010b; Lynch 2010).

China, on the other hand, does allow imports of U.S.-grown apples but these imports are limited to Washington Red and Golden Delicious apples. Other Washington varieties such as Gala and Granny Smith are sold in China but are imported through Hong Kong and reach the mainland through ñgray marketò channels. These varieties probably will not be officially permitted to be directly imported into China until a resolution regarding the import of Chinese apples into the United States is reached (Fryhover 2010; Lynch 2010).

Unlike China, the United States exports a very limited amount of its processed apple products (Rowles 2001a; USDA ERS 2010a). At one time, Knouse Foods of Adams County (PA) had a larger presence in the export markets, especially in the Middle East. The end of apartheid sanctions meant that Knouse could no longer compete with South African processors in production and transportation costs. Today, Knouseôs exports are sent primarily to Central America and the Caribbean but exports account for less than 3 percent of the companyôs total sales revenue (Guise 2010).

Exports are a small but important segment of the fresh wholesale market for packinghouses in the Shenandoah-Cumberland Valley Fruit District. John Rice, Vice President of Rice Fruit Company, estimates that between 5ï 10 percent of the fruit sold by the Adams County (PA) packinghouse is exported. Rice notes that while the Red

Delicious has been losing favor among the American public, it still is a nice apple for export (Rice 2010, Lehnert 2012c). In Virginia, four packinghouses, including Fred L. Glaize of Winchester and the Turkey Knob Growers of Timberville, formed the Virginia Apple Trading Company in 2003 to encourage exports. The partnership has proven beneficial by enabling the packers to share loads for filling large overseas orders and to share export-related costs. The trading alliance exports to places such as Russia, Sri Lanka, and several Latin American and Caribbean countries including Cuba. The Virginia growers are making an effort to export varieties that are not traditionally exported such as Rome, Stayman, York, and Virginia Gold (Sparks 2004; Glaize 2010a; Hornick 2012). One thing that Rinehart Orchards of Smithsburg (MD) touts as a regional advantage is proximity to the port of Baltimore. The orchard can receive an empty container from the port, load it in a couple of hours, and have it back to the port ready to ship in the same day. Rinehart Orchards sends its apples to a buyer in Panama (Rinehart 2009).

The Processing Industry

Taking advantage of large supplies of low-cost apples, a processing industry has developed in most apple-growing regions (Smock and Neubert 1950; O'Rourke 1994). The processing industry provides markets for the packinghouse culls and for growers producing apples specifically for the processing market (Jacobs 1990; O'Rourke 1994; Rowles 2001a; Schotzko 2004; Lehnert 2007a, 2007b). While cull rates vary by local circumstances, the vice president of Rice Fruit in Adams County (PA) estimates that about 25 percent of the apples received by the packinghouse are culled and sent to the

Knouse Foods plants in nearby towns for processing (Rice 2010). Many growers, especially outside the state of Washington, grow apples specifically for the processing market. In places like Michigan, North Carolina, and Virginia, the majority of the apples produced are used for processing purposes.

The goal for growers focusing on processing apples is to produce a high percentage of ñpeelerò apples. Peeler apples are those that will be peeled of their skins and used for applesauce, pie filling, slices, or dried. These apples need to be large enough to peel and have good internal composition (O'Rourke 1994; Rowles 2001a). Because the skin is removed, cosmetic defects such as lack of coloring, sunscald, and flyspeck can be overlooked (Lehnert 2007b; Kearns 2010; Wenk 2010). Small apples or varieties that have poor processing characteristics are crushed into juice or cider. Growers can make money off of peeler apples but hover around the break-even point or lose money with juice apples (Schotzko 2004; Guise 2010; Miller 2010).

The processing industry is especially important in the Shenandoah-Cumberland Valley Fruit District. While the states in the Shenandoah-Cumberland Valley Fruit District account for only 3.8 percent of the national fresh market output, the Fruit District has a 17.9 percent share of the national production of processing apples. In 2009, 68.8 percent of apples produced in Pennsylvania, Maryland, West Virginia, and Virginia were processed. The processing percentage was even higher in the Shenandoah-Cumberland Valley Fruit District since areas such as eastern Pennsylvania and the Piedmont of Virginia, which are mostly devoted to producing apples for the fresh market, were also included in the statistics (USDA NASS 2010c).

Over one-half of the apples grown in Pennsylvania, West Virginia, and Virginia are used for applesauce, slices, pie filling and other canned products. During the 2004ï 2006 seasons, the three states accounted for 35.3 percent of the nationôs production of canned apple products (Table 5.11). The importance of the canned apple market to the Shenandoah-Cumberland Valley Fruit District is reflected in the fact that the York Imperial continues to be the most widely planted apple variety in the Fruit District (Figure 5.5; Table 5.13). York apples are valued by the processors for their high yields when cored and peeled, storability, and ability to maintain their shape when sliced and cooked (Nagurny 2002; Rollins 1970; Rowles 2001a). The desirability of York Imperials for slicing and applesauce blending purposes has meant that the processors are willing to pay a premium for a variety commercially unique to the Fruit District (Evans 1957; Rollins 1970). The price premium is part of a long-term strategy by the processors to encourage growers to keep planting York Imperials despite the varietyôs almost non-existent demand in the fresh wholesale market (Evans 1957; Rollins 1970).



Figure 5.5 York Imperial Apples

The lopsided York Imperial is valued by apple processors but has little demand in the national fresh wholesale market. While the York is the Fruit Districtôs leading variety of apple by acreage, few York Imperials are planted outside of the Shenandoah-Cumberland Valley Fruit District. The caption on the left side of the box says ñexcellent for all cooking purposes.ò Also, notice the ñEastern Applesò label in the lower right corner; Berkeley Co. WV.

Photograph by Joseph P. Guttmann

As a result of the price premiums, Fruit District processors mostly use apples intentionally grown for the processing market and add-in fresh market culls. This scenario contrasts with that of Washington, where the apples being processed are the culls of apples grown for the fresh market (Rollins 1970; Rowles 2001a; Schotzko 2004; Lehnert 2007a; Harsh 2011). One East Coast processing industry official noted that ñfresh (market) apples make bad processing applesò (Rowles 2001a, 17). For example, the Red Delicious apple, Washingtonôs top variety, is rated poorly for canning but is fine for juice (Ricks *et al*. 2002). This gives eastern processors a competitive advantage in making applesauce while Washington has an advantage in apple juice production (Rowles 2001a).

Table 5.13 Top Apple Varieties by Percentage of Acres in Each State

Washington (2011)	%	New York (2006)	%	Michigan (2007)	%	Virginia & Pennsylvania (2005/2008)	%
Red Delicious	25.9	McIntosh	17.4	Red Delicious	21.1	*York*	18.7
Gala	19.6	Empire	11.8	*Golden Delicious*	12.5	*Golden Delicious*	17.0
Fuji	17.4	*Rome*	8.2	*Jonathan*	8.9	Red Delicious	14.3
Granny Smith	11.1	Red Delicious	8.2	*Ida Red*	8.4	*Rome*	9.2
Golden Delicious	8.9	Cortland	7.2	*Rome*	7.3	Gala	6.5
Honeycrisp	5.4	*Ida Red*	6.3	Gala	7.1	*Fuji*	4.2
Cripps Pink	2.9	*Golden Delicious*	5.4	McIntosh	6.1	*Stayman*	2.8

Note: Varieties in *italics* are dual-purpose apples or apples primarily grown for processed products other than juice or cider

Sources: Motts.com and USDA NASS ï Washington Tree Fruit Acreage Report 2011, New York Fruit Tree and Vineyard Survey 2006, Michigan Fruit Rotational Survey 2006-2007, Pennsylvaniaôs Orchard and Vineyard Statistics 2008, 2005 Virginia Orchard Survey

Canned apples accounted for 37 percent of the national processing sector in 2009, while 43 percent of processing apples were used for juice and cider (USDA ERS 2010a). Processors prefer to press a blend of apple varieties to create a juice with a consistent acid-to-sugar ratio. Juice is sold as 100 percent fresh-pressed (not from concentrate), 100 percent from concentrate, or as a blend of the two (Rowles 2001a). Apple juice and apple juice concentrate are also used in a number of other fruit juice blends and fruit drinks. Sales of fruit drinks that have some fruit juice content have grown faster than pure fruit juices over the past two decades (Rowles 2001b; Pollack *et al*. 2010).

Historically, apple juice brands were sold in regional markets (O'Rourke 1994; Guise 2010). The only true national brand produced by an apple processor was Mottôs. The availability of cheap foreign concentrate beginning in the early 1980s lowered the entry costs for large bottlers (O'Rourke 1994; Rowles 2001b). This enabled companies like Coca-Colaôs Minute Maid brand and Pepsicoôs Tropicana brand to have national apple juice products by reconstituting the concentrate. Their bottling facilities did not need be located near a supply of fresh apples nor have the equipment to press the juice. This puts apple processors who press their own juice at a competitive disadvantage in terms of costs (O'Rourke 1994; Guise 2010).

Cider is a naturally cloudy apple juice that has not been filtered and clarified like the golden apple juices found on store shelves (O'Rourke 1994; Rowles 2001b; Nagurny 2002). While many of the larger apple processors will produce a cider product, many small producers of cider cater to local markets. Some small cider producers sell directly to the public at farm stands while others will have wholesale contracts with grocery stores (PASA 2006). Apples that cannot even make the grade for juice or cider are used for cider vinegar (O'Rourke 1994). Not surprisingly, apples used for vinegar are accorded the lowest prices of all processing apples.

Frozen and dried apples combine for 13.5 percent of the processing sector (USDA ERS 2010a). Foodservice and other food processors are the most important market outlets for both of these categories. Frozen slices are primarily sold to small or industrial bakeries for pies and other pastries (Rowles 2001a; Edwards 2004). Some dried apples are sold at retail for snacking but most dried apples are used for ingredients in other food

products. These include breakfast cereals, pastries, cake mixes, and cookies (O'Rourke 1994; Boland *et al*. 2007; Wilhelm 2010). Dried apples can also substitute for a more expensive fruit in a cereal by being ñinfusedò with flavoring (Tree Top Inc. 2010). For example, the ñstrawberriesò and ñpeachesò in Quaker Oats Instant Oatmeal are actually dried apples. Growers are typically paid peeler prices for frozen apples while the price for dried apples usually falls around the juice price (USDA ERS 2010a).

Processors vary in their business model depending on their *raison d'être*. Grower-owned cooperatives were formed as a way to market excess and low-grade apples. Their goal is to reap the benefits of vertical integration by capturing the returns of several stages of the commodity chain instead of just being suppliers of raw products (Jacobs 1990; Guise 2010). Examples of large, multi-product apple processing cooperatives include Tree Top in Washington, Cherry Central in Michigan, and Adams Countyôs (PA) Knouse Foods (Jacobs 1990). The business strategies of grower cooperatives may differ from a processor that operates as a division of a multinational company. For example, Mottôs in New York is a division of the Dr. Pepper Snapple Group and was previously owned by Cadbury-Schweppes (Boland *et al*. 2007; Dr. Pepper Snapple Group 2011). Other operations, such as Winchesterôs (VA) National Fruit Product Company and Shenandoah Countyôs (VA) Bowman Apple Products, are family or employee-owned companies.

Large Apple Processors of the Fruit District

With five processing plants located in Adams and Franklin (PA) counties, Knouse Foods is the largest apple processor in the Fruit District (Knouse Foods 2010). Knouse

Foods is competitive at the national level with Mottôs and Tree Top. For a more thorough discussion on the business strategies of Knouse Foods, see Appendix Eight.

Winchesterôs (VA) National Fruit Product Company has about one-half the annual sales of Knouse Foods (Gillespie 2010; Lehnert 2011e). National Fruitôs retail brand, ñWhite House,ò is one of the standard brands found on retailer shelves in the Southeast and Mid-Atlantic regions of the country (Figure 5.6). National Fruitôs product line is similar to Knouseôs product line but National does not offer pie fillings. On the other hand, the White House brand does seem stronger in the vinegar category.



Figure 5.6 Major Brands of the Fruit District Apple Processors

Top Left - Knouse Foods bought the C.H. Musselman Company of Biglerville, (Adams County) PA in 1984. Top Right - Lucky Leaf is the original retail brand of the Knouse Foods growersô cooperative. Lucky Leaf is most noted for pie fillings. Bottom - National Fruit Product Companyôs White House brand. Both the Musselmanôs and White House labels were established pre-1910 while Lucky Leaf dates to 1949. Bowman Apple Products does not have a major retail label.

Logos taken from whitehousefoods.com and mybrands.com

Several interviewees suggested that National Fruit had experienced a period of financial difficulty (Kitchen and Boarman 2010; Marini 2010). In 1996, National Fruit had the twelfth largest apple orchard operation by acreage in the nation but large, annual financial losses in orchard operations forced the company to discontinue orchards in northern Rockingham County (VA) and northern Berkeley County (WV) and outsource its orchard management in other locations (*American/Western Fruit Grower* 1996; Kearns 2010; Kitchen and Boarman 2010; Miller 2010; Hunt 2011). National Fruit has also lost some of its private-label accounts and government contracts because of competition from other apple processors (Kitchen and Boarman 2010). Since the mid-1990s, National Fruit has closed or stopped fruit production at facilities in Kent City (MI), Delta (CO), Lincolnton (NC), and Timberville (Rockingham County, VA). All fruit processing now takes place at the Winchester (VA) facility. At one time in expansionist mode, National Fruit has been focusing its resources on its strengths in its core regional southeastern U.S. market (Gillespie 2010; NFPC 2010).

Mt. Jacksonôs (Shenandoah County, VA) Bowman Apple Products, on the other hand has been expanding its operations (Marini 2010). Bowman does not have a retail brand but is a manufacturer of private-label applesauce, apple juice, and apple butter. Bowman also co-packs for manufacturers of teas, enhanced waters, and other beverages (BAP 2011). For example, until recently, Bowman had a long-term contract to bottle Gatorade (Heffernan 2009). The company sources its apples from the 2,500 acre holdings of the Bowman Fruit Sales/Turkey Knob Growers group and other growers (*American/Western Fruit Grower* 2012). A recent joint venture with the French company

Andros et Cie has Bowman Apple poised for another expansion of production capacity (BAP 2011).

Since the 1980s, several apple processing facilities in the Shenandoah Valley Fruit District have closed. Both companies that specialized in frozen fruit slices have gone out of business. The Ranson Fruit Company in Jefferson County (WV) shut down after the 1982 harvest while Winchesterôs (VA) Zeropak closed its doors in 1998 (Huehn 1993; Edwards 2004). In 1985, National Fruit purchased the Shenandoah Valley Apple, Cider, and Vinegar Companyôs processing facility that was located adjacent to Nationalôs facility in Winchester (VA) (NFPC 2010). Both National Fruit and Knouse Foods have closed large plants in Berkeley County (WV) (Huehn 1993; Cox 2008; NFPC 2010). In 2007, Mottôs ceased apple processing in Adams County (PA). Mottôs Aspers (PA) facility is now used for bottling Hawaiian Punch and other drinks as well as a dry goods distribution center (Guise 2010; Harper 2010). Finally, although the facility was located in eastern Pennsylvania, several Fruit District growers were once members of the Berks Lehigh Growers Cooperative which produced the popular Red Cheek apple juice. The cooperative was dissolved in the late 1980s (Holton 1986; Bieber 1987; Miller 1993b; Guise 2010).

Competition

In the Shenandoah-Cumberland Valley Fruit District, packinghouses located outside the region provide the main competition in the fresh wholesale market. The volume, competitive pricing, marketing power, and quality of apples grown in Washington have enabled that state to dominate fresh apple sales at retail chains. As a

result of Washingtonôs strong position in the high-value, bulk bin category, packinghouses in the central and eastern United States have focused on selling bagged apples (Bentley 2010; Burfield 2010; Gomez *et al.* 2010; Marini 2010; Rice 2010; Michigan Ag Connection 2011; Offner 2011a). Although the buy local movement has helped Adams Countyôs (PA) Rice Fruit Company gain more market penetration in the bulk bin displays in recent years, the company still packs the majority of its apples in three- and five-pound bags (Rice 2010; Lehnert 2012c). Likewise, the apples from Washington Countyôs (MD) Rinehart Orchards that are intended for the domestic market are packed in bags, while the packinghouse sends its tray-packed, loose fruit to its Panamanian customer (Rinehart 2009).

While Washingtonôs many advantages create market access difficulties in the bulk bin category, Michigan and New York are direct competitors to the Shenandoah-Cumberland Valley Fruit Districtôs packinghouses in the bagged apple category. Both Michigan and New York are prone to fluctuations in their annual apple output and when one state has an especially large harvest, the competition between the eastern regions becomes keen (Glaize 2010a, Rice 2010). Four out of the six Fruit District packers who answered my survey indicated that growers from other regions in the eastern United States were their main source of competition while the other two selected Washington. John Rice singled out the Michigan packers as providing the most competition with bagged apples especially in Florida and other southern markets (Rice 2010; Michigan Ag Connection 2011). He notes that the Michigan packinghouses often come in $2ï $4 cheaper per box than Rice Fruitôs price. Rice attributes the lower prices to a more

competitive environment in Michigan. The state has more packinghouses than Pennsylvania and the packers may need to maintain lower prices just to survive in the state (Rice 2010).

None of the packers indicated that other growers in the Shenandoah-Cumberland Valley Fruit District were their main source of competition. A dog-eat-dog competitive environment does not exist among the packers in the Fruit District, as packers tend to cooperate and view those outside the area as the competition (Glaize 2010a; Source 1103 2010). Bear Mountain, Bream, and El Vista, three medium-sized Adams County (PA) packinghouses, counteract their smaller sizes by working together. The three packers will not compete in each otherôs market area and they will share truck loads if one packer is short on a product that another packer has in stock. While the three packers do not share truck loads with Rice Fruit, the largest packinghouse in the Fruit District, they do have a congenial working relationship with the large packer and information is shared among all four packers in Adams County (Sollenberger and Kammerer 2007, Source 1103 2010). ñWe want to separate ourselves from the rest of the country, yes, but not from our neighborsò says Jack Bream of Bream Orchards (Sollenberger and Kammerer 2007).

Growers in the Shenandoah-Cumberland Valley Fruit District were asked on the mail survey who they perceived to be their main source of competition. Over 50 percent of growers in the Fruit District said that foreign apples and apple products were their main source of competition (Table 5.14). This result was not unexpected considering the negative impact cheap foreign concentrate has had on processing prices and that nearly

35 percent of the growers in the Fruit District sell at least 85 percent of their crop to processors. More surprising was the higher-than-expected percentages of fresh wholesale and direct market growers selecting foreign apple products as their main source of competition. I had expected a greater degree of agreement between the growersô market outlet and their perceived main source of competition. While more direct market growers than the other types of growers cited ñother growers in your regionò as their greatest source of competition, the percentage was under 40 percent and lower than the percentage of direct market growers selecting foreign apple products. The results were closer to the expected outcomes for fresh market wholesale growers and processing growers. Nearly 65 percent of fresh market wholesale growers had selected either Washington or other eastern apple-growing districts as offering the most competition. This matches the percentage of processing growers selecting foreign apple products as their main source of competition. Almost 20 percent of processing growers selected other eastern apple-growing regions as their main source of competition. Large crops or weather events such as hail can divert apples intended for the fresh market into the processing sector. A dramatic increase in supply in one region lowers the processing price for all regions (Kane 2008). ñMichigan and New York just ókilledô us last yearò noted one processing grower (Source 4128 2010).

Table 5.14 Survey Question: Who do you feel is your main source of competition?

	Overall	Direct Market Growers	Fresh Wholesale Growers	Processing Growers
Other growers in your region	15.5%	37.5%	14.3%	6.5%
Growers from other regions in the eastern United States	15.5%	8.3%	25.0%	19.6%
Washington State	25.9%	20.8%	39.3%	15.2%
Foreign apples and apple products	53.3%	45.8%	32.1%	65.2%

Direct Market Growers = Sells 30% or more at farmers market, retail on farm, or other direct outlet; N = 24
Fresh Wholesale Growers = Sells 50% or more through a packinghouse or other wholesale outlet; N = 28
Processing Growers = Sells 85% or more to processors; N = 46
Note = Percentages will not add up to 100 percent. While growers were asked to only select one answer, 14 growers selected two answers. Those answers were included in the percentages.
Source: Authorôs Mid-Atlantic Survey

Government and Associations

Government

In addition to trade policy, government plays an important role in the apple industry through risk management schemes, temporary subsidies, feeding programs, regulations, and funded research (Perez 2012a). The unpredictability of weather can occasionally have disastrous results for growers. Heavy winds, a late frost, hail, and severe drought can all cause crop loss. To counter this risk, growers purchase crop insurance through private insurance companies at rates that are heavily subsidized by the government (Harper 2010; USDA ERS 2009). The purpose of the crop insurance program is to provide enough coverage at an affordable rate so that growers can survive a catastrophic weather event without putting the grower or the insurance company out of business. Growers are not covered for normal market fluctuations. Growers also have to

be enrolled in the program if they are to receive federal disaster assistance aid. One form of disaster aid is the Orchard and Nursery Tree Assistance Program. This program pays 70 percent of the cost to replant new trees and one-half of the costs to salvage trees damaged from a natural disaster (USDA ERS 2009).

Like most growers of fruits and vegetables, apple growers are not eligible to receive the direct payments or countercyclical payment subsidies associated with commodities like corn, wheat, and cotton (Perez 2012a). An exception occurred from 2001ï 2003 with the Apple Market Loss Assistance Program. This temporary direct subsidy was intended to help growers weather a period of low prices caused by the dumping of Chinese apple juice concentrate on the United States market. Weather-related problems and fire blight were also used to justify the subsidy (Rep. Hinchey (D-NY) 2001). Funds were distributed proportionally according to the growerôs production. The largest growers each received $150,102 over the course of the three-year program (EWG 2010).

The government has been increasing its purchases of fresh fruit and vegetables for domestic nutrition assistance programs. In 2011, for example, the federal government spent $150 million to distribute free, fresh fruits and vegetables to elementary schools with high percentages of children receiving free or reduced-priced lunches (Andrews 2009). In addition to fresh apples, processed apple products and fresh-cut apple slices are also purchased for domestic feeding programs (Karst 2011b). In 2007, USDA purchased 53.9 million pounds of apple products to donate to the school lunch program, food distribution on Indian reservations, nutrition for the elderly, and disaster relief (U.S.

Apple Association 2007). To encourage the consumption of fresh fruits and vegetables, USDA administers the WIC Farmers Market Nutrition Program and the Senior Farmers Market Nutrition Program. These programs provide coupons to low-income senior citizens and low-income women with young children that can be redeemed for fresh produce at farm stands and farmersô markets (Martinez *et al*. 2010). Besides feeding programs, government institutions such as military installations, correctional facilities, and Veterans Administration hospitals purchase large quantities of fresh apples and apple products for their general foodservice operations.

Selling to the government comes with strings attached. Since 2007, the USDA has required growers that sell to the government to be in accordance with Good Agricultural Practices (GAP) for farming activities or Good Handling Practices (GHP) for packing, storage, or wholesale distribution functions (*Fruit Grower News* 2009c; USDA AMS 2011). This is partly a response to the recent outbreaks of sickness caused by tainted spinach, tomatoes, peppers, and peanut butter. Growers now must have standard operating procedures defining how they and their workers handle ordinary farming tasks and situations that may arise. They must also be certified by an annual audit (*Fruit Grower News* 2009c). With the extra paper work and the expense of having to pay for the audit, obtaining GAP certification can be burdensome, especially for small growers with fewer resources (University of Maryland 2011). This situation is akin to large retail buyers requiring growers to institute certain orchard practices and improve the traceability of the fruit produced. The growers either comply with the new standards or they can decide to no longer sell their fruit to that retail chain (McKenna *et al*. 1998;

OôRourke 1998; Granatstein 2000). Because a company like Gerber uses stronger standards than the USDA, some growers have to pay for multiple audits from private industry and government (*Fruit Grower News* 2009c).

Other regulations that the government monitors include worker safety, food safety, and the use of agricultural chemicals. The Environmental Protection Agency determines which chemicals may be used, the frequency of usage, and the tolerance level for pesticide residues while the Food and Drug Administration enforces these guidelines through inspections (Foulke 1993). A frequent complaint among growers concerned tighter pesticide regulations. Growers noted that older pesticides are being taken off the market and are being replaced more expensive sprays. These new, ñreduced-riskò sprays are more targeted towards certain pests and require a higher vigilance by the grower to be effective. Based on their own practical experience, many growers are skeptical of the actual need to restrict or eliminate the less expensive older sprays which the government had previously deemed safe (Harper 2010; Kitchen and Boarman 2010; Miller 2010; Source 1103 2010; Source 1111 2010; Source 3199 2010; Hull and Krawczyk 2011).

One area where a new food safety regulation has impacted the apple industry is in cider-making. In 2001, the FDA began requiring all cider makers who sell to wholesalers, retailers, or custom press for other growers to pasteurize their product in order to limit the possibility of the presence of pathogens like *E. coli* (McCarthy 2008). Now, many small-to-medium cider press operations are feeling the squeeze. Installing an ultraviolet or heat pasteurization unit can run $30,000 plus regular maintenance costs. It is an investment that is hard for a small producer to recover without sufficient volume.

As a result, some consolidation in the industry has occurred as cider makers who have invested in pasteurization equipment have taken the wholesale contracts of those who did not make the upgrade (PASA 2006).

One of the more important functions of government in the apple industry is in research and outreach programs. The funding of research has been underwritten at both the federal and state level. At the federal level, 17 scientists and 80 staffers work at the USDAôs Appalachian Fruit Research Station (AFRS) in Kearneysville (Jefferson County), West Virginia. Projects at the AFRS range from identifying the genes that affect rootstock size to carbon sequestration in the orchard. The AFRS has also been playing a leading role in determining an effective response to the brown marmorated stink bug, an invasive species from China (Figure 5.7). The stink bug has been causing major damage to orchard crops in the Mid-Atlantic region (Lehnert 2010b).

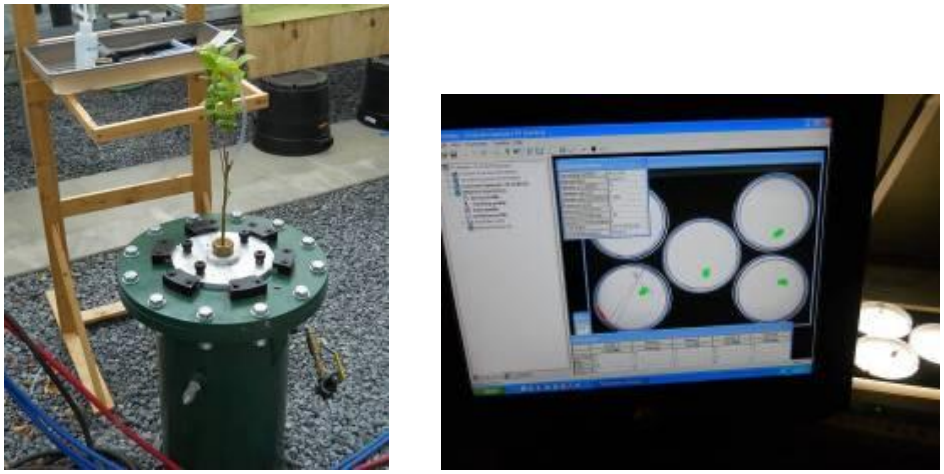


Figure 5.7 Research Projects at the USDA Appalachian Fruit Research Station

Left ï Pressurized sap extractor used to study apple genes *Right* ï Tracking the movements of the brown marmorated stink bug in Petri dishes after the application of different pesticides; Jefferson Co. WV
Photographs by Joseph P. Guttmann

Land-grant universities are the primary research outlet at the state level. Funded by state government appropriations, state apple associations, industry, and federal research grants, university research tends to focus more on specific issues facing that state (Cornell University 2008; Marini 2010). Penn State, West Virginia University, and the Virginia Polytechnic Institute and State University (Virginia Tech) all have their tree fruit experimental farms located in the Shenandoah-Cumberland Valley Fruit District. Additional research takes place at the main campuses and at test plots in local commercial orchards.

One of the most important roles of a land-grant university is educational outreach to growers. Universities use a network of county extension agents to share expertise and give assistance to growers. Field demonstrations of new technologies and research results are disseminated to growers at open houses held at the research stations and at twilight meetings held at local orchards. By transmitting research results and exposing growers to new ideas and farm practices, extension agents become agents of change. In this sense, they are one of the key catalysts in a growerôs decision to try and later adopt a new technology or farm practice (Rogers 1983; Leuthold 1987).

Promotional campaigns are another role often undertaken by a stateôs department of agriculture. These campaigns aim to differentiate a stateôs agriculture through branding. Examples from the Shenandoah-Cumberland Valley Fruit District include the ñPennsylvania Preferred,ò ñMarylandôs Best,ò ñWest Virginia Grown,ò and ñVirginiaôs Finestò programs. These state marketing campaigns are not product specific but do include apples. These states also support agritourism by printing and distributing guide

brochures to the stateôs pick-your-own operations, farm stands, and other agricultural businesses. Once again, while not exclusive to apples, many apple operations are featured.

Associations

Like other self-employed businessmen and women, many growers belong to industry associations at the local, state, national, and international levels. The purpose of some associations is primarily research, education, the dissemination of new ideas, and the discussion of common problems. For example, the mission of the International Fruit Tree Association (IFTA) is to improve operational efficiencies and fruit production by promoting the understanding and use of dwarf trees in high-density orchard systems (IFTA 2011). One recent example of the diffusion of ideas happened at the 2004 IFTA annual conference held in Bolzano, Italy where tours of nearby orchards helped spark renewed interest in moveable orchard platforms in the United States (Sazo *et al*. 2010).

Many associations are geographic in nature as their purpose is to promote the output of a specific state or locality. Local fruit associations sometimes exist if there are enough growers in a concentrated area and their *raison d'être* differs from the state association. For example, the Frederick County (VA) Fruit Growers Association coordinates the paperwork for H-2A visas and runs a seasonal labor camp for migrant workers in Winchester, Virginia (Kearns 2010). In Pennsylvania, the Adams County (PA) Fruit Growers Association sponsors an annual Apple Blossom Festival, crowns the Pennsylvania Apple Queen, and donates research money to the countyôs Penn State Fruit Research Center (PA) (Horst 1999; Komancheck 2010).

At the state level, associations can cater to all fruit growers through horticultural societies or specifically to apple growers. Depending on the organization, money for state associations is collected through membership dues or assessments on production to fund horticultural and market research, lobbying, and promotional efforts. All four states in the Shenandoah-Cumberland Valley Fruit District have state horticultural societies. The State Horticultural Association of Pennsylvania (SHAP) is primarily an educational society that manages a fruit research endowment fund and publishes the journal *Pennsylvania Fruit News*. SHAP also co-sponsors the Mid-Atlantic Fruit and Vegetable Convention which annually attracts almost 2,000 participants to Hershey, Pennsylvania (SHAP 2012). Marketing boards exist in Pennsylvania, Maryland, and Virginia for the promotion of each stateôs apple crop. For example, the Pennsylvania Apple Marketing Program promotes Pennsylvania-grown fresh and processed apples through point-of-sale retail promotions at supermarkets, general advertising, and representation at trade shows. Each state, with the exception of West Virginia, has a website dedicated to the promotion of that stateôs apple industry (MAPB 2008; PAMP 2010; Rice 2010; VAGA 20011).

Historically, the state association with the most influence in the apple industry has been the Washington Apple Commission (WAC). Annual WAC funds were spent to boost short-term sales volume in high production years through in-store displays, special promotions, and other point-of-sale advertisements. Money was also targeted at middlemen and retailers to effectively secure and expand grocery shelf space for Washington apples. Advertising campaigns utilizing the iconic Red Delicious with the ñWashingtonò banner across the apple were used to build a long-term brand image with

the consumer (Jarosz and Qazi 2000; van Voorthuizen 2001). While the apple industry benefited from the WACôs campaign to raise the visibility of the apple, the scale of Washingtonôs production and its high grower assessments made it difficult for growers from other states to compete for shelf space. The $22 million spent following the 1998 season demonstrates the one-time strength of the WAC as its advertising and promotions budget was ten times greater than that of the U.S. Apple Association, the primary national apple association (van Voorthuizen 2001; U.S. Apple Association 2010b).

Following a 2003 federal court ruling that outlawed the mandatory grower assessments for domestic market promotion, WAC promotional activities were limited to the export market. As a result of this reduction in the scope of their mission, grower assessments fell from 40 cents per box to just 3.5 cents per box (Schotzko 2004; Wilmot *et al*. 2008; WAC 2010a). The void created by the demise of WACôs domestic promotion has been partially filled by private marketers. Much money has been spent by these marketers promoting their own brands and fighting for market share among themselves. Citing a lack of a coordinated effort for the generic promotion of apples, critics of the current system have noticed that the goodwill generated by the WAC promotions has been fading and worry about the apple industry losing market share to competing fruits and snacks (Warner 2009b; Belrose Inc. 2010c).

At the national level, the most important association is the U.S. Apple Association. Based in Vienna, Virginia near Washington, D.C., its primary purpose is to act as a national policy advocate for the entire apple industry. Primarily funded by associations at the state level, the U.S. Apple Association presents a united front for what

is essentially an individualistic profession. Lobbying efforts in the past have helped obtain emergency funding for brown marmorated stink bug research, increased purchases of fresh apples and apple products for federal feeding programs, and funded research to mechanize orchard tasks through Specialized Crop Research Initiative grants (Hefling 2007; U.S. Apple Association 2007, 2010c, 2012b; Offner 2011b). In 1999, U.S. Apple Association filed a complaint with the United States International Trade Commission over the dumping of cheap Chinese apple juice concentrate in the American market. This led to the institution of tariffs in 2000 on the offending producers (van Voorthuizen *et al.* 2001). The U.S. Apple Association has also been vocal in its support of immigration reform. For the past decade, it has advocated for a streamlining of the H-2A visa program in exchange for a pathway to citizenship for experienced, but undocumented, agricultural workers. The proposed legislation has yet to pass (Idlebrook 2010).

Growers and apple industry leaders from the Shenandoah-Cumberland Valley District have been in prominent leadership positions within the U.S Apple Association. In recent years, at least three men from the Fruit District have served as the Chairman of the Board for the U.S. Apple Association (Guise 2010; Lehnert 2012c). One former chairman, Phil Glaize of Frederick County (VA), regularly testifies in front of Congress as a representative of the apple industry (Mangino 2006a; Kane 2008; Glaize 2010b). According to another former chairman, in addition to the quality of its people, Pennsylvania and Virginia have traditionally provided national leadership because the area is seen as a political unifier by the big three states of Washington, New York, and Michigan (Rice 2010).

Finally, the United States Apple Export Council (USAEC) is an alliance of member states that includes New York, Michigan, Pennsylvania, Virginia, California, and the six New England states. It is funded by assessments paid by the statesô apple marketing associations based on the amount exported from that state and by matching funds from the USDAôs Market Access Program. Similar to the Washington Apple Commission, the purpose of the USAEC is to promote member statesô apples in international markets. Some of their methods include displays at international trade conventions and the hosting of trade missions to foster relationships between shippers and receivers (Rice 2010; USAEC 2010; USDA FAS 2011).

Key Findings from Chapter Five

- Washington and New York have higher average apple yields per acre than the Shenandoah-Cumberland Valley Fruit District. The lower tree densities in the Fruit District can be partially attributed to environmental and economic constraints. For example, many processing growers do not feel that converting to higher tree densities is economically feasible.
- Adams County (PA) growers and Penn State researchers have been in the national forefront in developing and testing new technologies that increase labor efficiencies.
- Environmental constraints and the lack of existing infrastructure has limited Fruit District growers from participating in important industry trends such as growing organic apples, producing for the fresh-sliced apple market, or growing new managed-released apple varieties.

- Fruit District growers and packers have been able to tap into the ñbuy localò movement to gain increased access to grocery shelf space in regional supermarkets.
- National apple acreage has declined by almost 25 percent in the past 10 years but apple production has only declined by around 8 percent. There has been a gradual increase in the percentage of the national apple crop that is sold on the fresh market because fresh market prices have been rising at a faster pace than processing prices.
- The scale of Washingtonôs packinghouses and the sheer volume of high-grade, attractive fruit from that state have put Fruit District packinghouses at a competitive disadvantage in the national fresh wholesale market. Packers from Washington dominate the most lucrative wholesale sector, the grocery store bulk bin displays.
- Packinghouses in the Shenandoah-Cumberland Valley Fruit District have indicated that that some of their stiffest direct competition comes from bagged apples from Michigan and New York.
- The Washington Apple Commission (WAC) was once the most powerful marketing association in the apple industry. Its successful advertising campaigns built the Washington apple brand and helped secure and expand the stateôs market share in the fresh wholesale sector. The long-term effects of the loss of the WACôs domestic promotional campaign remain to be seen.

- The Shenandoah-Cumberland Valley Fruit District relies heavily on the production of processing apples, especially for canned apple products. The two apple varieties with the highest percentage of acreage in the Fruit District are mostly grown for processing purposes. Unfortunately for the growers of the Fruit District, processing prices have stagnated or declined in the past 20 years.
- Chinese apple juice concentrate has largely displaced domestic apple juice as well as imported apple juice concentrate from other countries in the U.S. market. The potential entrance of Chinese applesauce and fresh apples into the U.S. market poses a significant future threat to the U.S. apple industry in terms of price competition.
- The entrance of cheap, foreign apple juice concentrate lowered the price floor for all processing apples. A majority of growers in the Fruit District consider foreign apples and apple products as their main source of competition.

CHAPTER 6: REGIONAL ISSUES CONFRONTING THE APPLE INDUSTRY IN THE SHENANDOAH-CUMBERLAND VALLEY FRUIT DISTRICT

Chapter Six examines issues in the apple industry that are mostly unique to the Shenandoah-Cumberland Valley Fruit District. The chapter begins with a discussion about the increasing integration of the Fruit District with the Washington-Baltimore metropolitan area. Topics include commuting patterns, new residential growth, and job growth within the Fruit District. Growers were questioned about their perception of the intensity of development pressures and how population growth has impacted their farm operations. Development pressures are not the factors behind the regional apple acreage decline. The loss of a one-time comparative advantage for the orchards in the Appalachian Ridge and Valley province is explained. Because the Fruit District includes portions of four states, regional cooperation and the lack of cooperation is discussed in the next section. Chapter Six concludes by addressing the means by which growers obtain the necessary labor to operate the farm.

Urban Growth Pattern

The Shenandoah-Cumberland Valley Fruit District presents an excellent case study of the effects of growth in the rural-urban fringe on agriculture. Prior to the 1960s, this region of small cities and rural expanses was still rather isolated from the large East Coast population centers. The catalyst for the economic transformation of the Fruit District was the completion of the interstate highway system. Paralleling and superseding U.S Route 11 in importance, the north-south Interstate 81 runs the length of the Valley (Figure 3.2). Important east-west cross routes include the Pennsylvania

Turnpike (I-76) at Carlisle (PA), Interstate 70 at Hagerstown (MD), and Interstate 66 south of Winchester (VA) (Figure 3.10). The building of the interstates attracted industrial plants such as DuPont, Corning Glass, and General Motors to West Virginiaôs Eastern Panhandle and Mack Trucks to Hagerstown (MD) (Doherty 1972). The interstates also enabled the outward growth of the Washington-Baltimore metropolitan area. Increased job opportunities within the Shenandoah-Cumberland Valley Fruit District and its partial incorporation into the Washington, D.C. commuter shed has led to a rapid rise in population. Since 1980, the 12 counties and two independent cities of the Fruit District have added 373,993 people for a total population of 1,118,796 (Table 6.1). This is a growth rate of 50.2 percent compared to the overall U.S. growth rate of 36.3 percent (U.S. Census Bureau 2007; 2011). Despite this growth, only two cities in the Shenandoah-Cumberland Valley Fruit District, Harrisonburg (VA) and Hagerstown (MD), have populations exceeding 35,000 (U.S. Census Bureau 2011).

The prime mover for growth in the Shenandoah-Cumberland Valley Fruit District has been the outward spatial expansion of the Washington-Baltimore metropolitan area and the Valleyôs functional incorporation into the East Coastôs urban conurbation, Megalopolis, as a whole (Gottmann 1961; Greene and Benhart 1992). This integration is reflected in the commuting patterns, housing market, and employers who are attracted to the area. The growth of the Washington, D.C. metropolitan area has historically been tied to the federal government and its numerous contractors, lobbyists, professional associations, lawyers and other support services. By 2005, the Washington, D.C. metropolitan area had also seen a significant increase in the number of jobs in the

professional and business service sector. Jobs in this sector include technical and management consulting, information technologies, and computer systems design. While 69 percent of the federal jobs in the Washington, D.C. Metropolitan Statistical Area (MSA) are located in the inner core of Washington, D.C., Arlington (VA), and Alexandria (VA), the majority of jobs in the professional and business sectors are located in the suburban counties of Montgomery (MD), Prince Georges (MD), Fairfax (VA), and Loudoun (VA) (Perrins and Nilsen 2006). Many of these jobs are located in two technology corridors: Montgomery Countyôs (MD) I-270 Technology Corridor that specializes in biotechnology and the Dulles Toll Road corridor which connects Dulles Airport area in eastern Loudoun County (VA) to the edge city of Tysonôs Corner, in Fairfax County (VA) (Knox 1991; Lewis 1995).

Table 6.1 Shenandoah-Cumberland Valley Fruit District Population Trends

County	1980	1990	2000	2010	Population Change 1980–2007	Percentage Change 1980–2007
Adams PA	68,292	78,274	91,292	101,407	33,115	48.5%
Franklin PA	113,629	121,082	129,313	149,618	35,989	31.7%
Cumberland PA	178,541	195,257	213,674	235,406	56,865	31.8%
Washington MD	113,086	121,393	131,923	147,430	34,344	30.4%
Berkeley WV	46,775	59,253	75,905	104,169	57,394	122.7%
Jefferson WV	30,302	35,926	42,190	53,498	23,196	76.5%
Hampshire WV	14,867	16,498	20,203	23,964	9,097	61.2%
Morgan WV	10,711	12,128	14,943	17,541	6,830	63.8%
Frederick Co. Winchester City VA	54,367	67,670	82,794	104,508	50,141	92.2%
Clarke VA	9,965	12,101	12,652	14,034	4,069	40.8%
Shenandoah VA	27,559	31,636	35,075	41,993	14,434	52.4%
Rockingham Co. Harrisonburg City VA	76,709	88,189	108,193	125,228	48,519	63.3%
Total	**744,803**	**839,407**	**1,076,010**	**1,118,796**	**373,993**	**50.2%**

Source: US Census Bureau

The Washington metropolitan area has been experiencing growth in housing on all sides of the District of Columbia. To the Districtôs northwest, the suburban edge has extended out to Germantown in Montgomery County (MD) and Leesburg in Loudoun County (VA) (Figure 6.1). Beyond these areas, there is more rural, open land between housing subdivisions as the region takes on a more exurban feel. The growth in Loudoun County (VA), which borders the Shenandoah-Cumberland Valley Fruit District, has been especially dramatic. Loudoun County has grown from a population base of 86,129 in 1990 to 312,311 in 2010, making it one of the fastest growing counties in the nation (Cohn and Laris 2004; U.S. Census Bureau 2011). Because both the federal government and the professional and business service sector offer a number of high paying jobs, suburban Washington is an affluent area. In 2010, Loudoun County (VA), Fairfax County (VA), and Howard County (MD) had the highest median household incomes in the United States while Arlington (VA) and Montgomery (MD) counties were ranked nine and ten respectively (Levy 2010). High-growth plus high incomes have resulted in high median owner-occupied house values (Table 6.2). In addition, concerns over the effects of rapid growth on the affluent populacesô quality-of-life and the strain of providing public services have led to building restrictions in western Loudoun County (VA) and policies that promote job growth but not housing in Fairfax (VA) and Montgomery (MD) counties (Laris 2003; Whoriskey 2004a, 2004b). These restrictive policies limit the supply of houses available in these counties, further increasing the cost of housing.

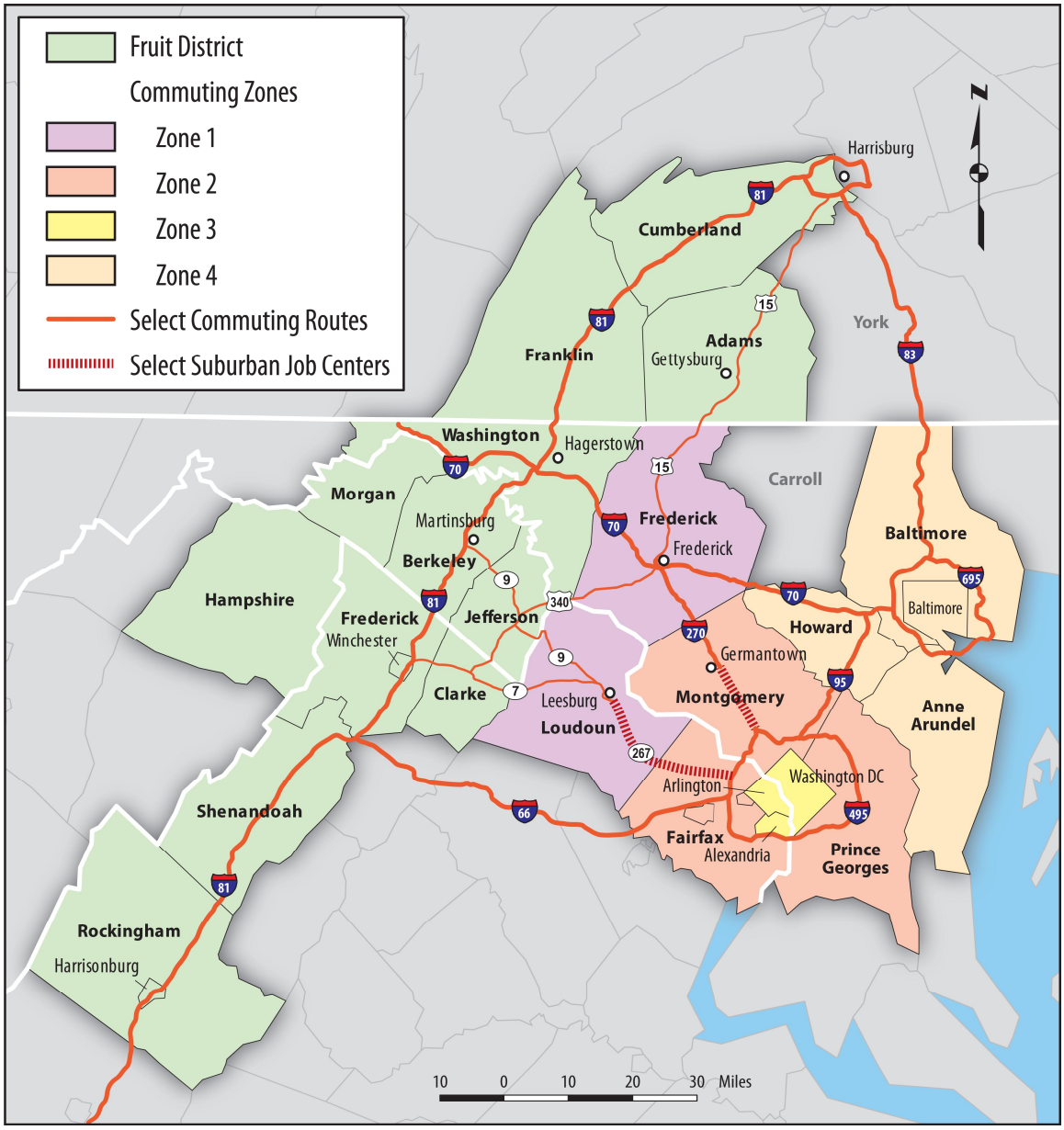


Figure 6.1 Spatial Relationship and Commuting Zones of the Shenandoah-Cumberland Valley Fruit District and Washington-Baltimore Metropolitan Area

Map by Will Fontanez and Joseph P. Guttmann

Table 6.2 Demographic Comparisons between Select Suburban Counties of Washington, D.C. and Select Fruit District Counties, 2005–2009

County	Median Household Income	Percentage with Bachelor's Degree or Higher, Age 25 +	Median House Value
Fairfax VA	$102,325	58.4%	$520,500
Loudoun VA	$114,200	56.5%	$508,300
Montgomery MD	$93,774	56.1%	$487,500
Frederick MD	$82,598	34.9%	$355,600
Clarke VA	$65,639	27.4%	$349,600
Jefferson WV	$58,859	28.7%	$259,400
Adams PA	$55,888	18.7%	$190,900
Washington MD	$48,883	18.3%	$233,200
Berkeley WV	$51,243	18.9%	$187,100
Frederick VA	$60,806	22.6%	$255,900
Shenandoah VA	$47,748	17.6%	$212,100
Franklin Pa	$47,611	17.5%	$166,700
Hampshire WV	$35,541	10.3%	$132,300

Source: US Census Bureau, *Census Quick Facts*

High housing costs and restrictive housing policies have pushed some residential growth into the development-friendly Eastern Panhandle of West Virginia and other parts of the Shenandoah-Cumberland Valley Fruit District. A gradient of lower median house values occurs as one travels west of Washington, D.C.ôs suburban counties (Table 6.2). Many home buyers who were previously renting or living in a townhouse in Loudoun County (VA) or another suburban county can afford a single-family detached house in the Valley. The trade-off for a larger, less expensive house is a longer commuting time because of the distance to the place of employment and potential traffic congestion along the way (Whoriskey 2004b).

Many of the new residential subdivisions in the Shenandoah-Cumberland Valley Fruit District target residents from the suburban counties in their marketing campaigns. For example, in an advertisement in a Jefferson County (WV) Chamber of Commerce publication, the developers of the 3,200 unit Huntfield housing development proclaim that it is ñonly 25 miles from eastern Loudoun County.ò Another development in the same publication states ñwhether you live and work in Virginia, Maryland, or even West Virginiaéò and goes on to tout the Blue Ridge Mountain skyline and easy MARC train access to Washington, D.C. The Valleyôs relationship with the Washington real estate market really hit home when my next-door neighborôs house ended up on the cover of the ñGreater D.C. Metro Homesò realtor guide book.

Table 6.3 enumerates the flow of workers from the counties of the Shenandoah-Cumberland Valley Fruit District that are within the Washington-Baltimore commuter shed. In 2000, 36,526 workers from these counties commuted to jobs in the Washington-Baltimore metropolitan region. These commuters accounted for 13.5 percent of all the workers from the Fruit District counties listed in Table 6.3. The percentage of workers who commute to the Washington-Baltimore metro region has likely increased since parts of the Shenandoah-Cumberland Valley Fruit District experienced a housing boom in the mid-2000s. Berkeley County (WV), Jefferson County (WV), and the combined Winchester City (VA) and Frederick County (VA) all grew by more than 25 percent in the first decade of the 2000s while the nation as a whole only gained 9.7 percent (U.S. Census Bureau 2011). Unfortunately, the statistics do not reflect this growth because the county-to-county worker flow data from the 2010 census will not be released until 2013.

Table 6.3 Number of Commuters from Select Shenandoah-Cumberland Fruit District Counties to Washington-Baltimore Metro Area Census 2000

Fruit District Counties	Zone 1	Zone 2	Zone 3	Zone 4
Adams Co. PA	1,744	433	124	1,184
Washington Co. MD Franklin Co. PA	9,248	3,530	700	853
Berkeley Co. WV Jefferson Co. WV	5,594	3,894	1,457	442
Frederick Co. VA Winchester City VA Clarke Co. VA	3,448	3,205	645	25

Zone 1 = Frederick Co. MD; Loudoun Co. VA
Zone 2 = Montgomery Co. MD; Fairfax Co. VA; Fairfax City VA; Manassas City VA; Falls Church City, VA; Manassas Park City, VA; Prince Georges Co. MD
Zone 3 = Washington, D.C.; Arlington Co. VA; Alexandria City VA
Zone 4 = Baltimore City MD; Baltimore Co. MD; Howard Co. MD; Anne Arundel Co. MD
Source: U.S. Census Bureau, *Census 2000 County-to-County Worker Flows*

In 2000, 2,926 workers from the Shenandoah-Cumberland Valley counties listed in Table 6.3 made the long daily trip to Washington, D.C., Arlington (VA), or Alexandria (VA). This is a high number considering that Washington, D.C. is 60 miles from Charles Town (Jefferson County, WV), 70 miles from both Hagerstown (MD) and Winchester (VA), and 85 miles from Martinsburg (WV). Some commuters in West Virginia's Eastern Panhandle opt to take the two-hour long MARC train ride from Martinsburg (WV) or Harpers Ferry (WV) to Washington's Union Station. The provision of the MARC train service is the most likely reason why nearly half the commuters to the inner core cities (Zone 3 in Table 6.3) are from the two West Virginia counties.

Most commuters from the Fruit District do not journey all the way into Washington, D.C. Over 11,000 commuters work in Zone 2 of Table 6.3 (Figure 6.1). Many of these commuters work in the suburban employment centers along Montgomery

Countyôs (MD) I-270 Technology Corridor and near the Dulles Toll Road in northern Virginia. The majority of commuters from the Fruit District work in Frederick County (MD) or Loudoun County (VA), two large, fast growing counties that border the Fruit District. While many of these commuters are associated with the federal government or in the professional and business services sector, a diversity of professions such as schoolteachers and construction workers are also included in the daily commute (Whoriskey 2004b). Frederick County (MD) acts as a transition zone between the more suburban counties and the counties located in the Shenandoah-Cumberland Valley Fruit District. Frederick County (MD) has large subdivisions that hug the Montgomery County line, burgeoning office and retail space at the junction of I-70 and I-270, and a gentrified downtown, but the county also has a lower median house value and lower educational attainment than the counties to its southeast (Figure 6.1; Table 6.2). Another smaller employment destination is the more traditional manufacturing city of Baltimore and its suburbs. While Baltimore is just as close to Hagerstown (MD) and Martinsburg (WV) as Washington, D.C., Zone 4 only attracts slightly more than 2,500 commuters from the Fruit District (Table 6.3). Only Adams Countyôs (PA) long-distance commuting patterns are geared more towards the Baltimore region. The rest of the Fruit District funnels most of its long-distance commuters to Washington, D.C. and its suburbs.

Reverse commuting is not common. Excluding Frederick County, Maryland, only 1,298 people live in the Washington, D.C. area and work in the Fruit District counties listed in Table 6.3. That is not to say that the relationship between the Shenandoah-Cumberland Valley Fruit District and the Washington-Baltimore

metropolitan area is only orientated one way. Thousands of people from the metropolitan area are connected to the Fruit District through a form of recreational commuting (Greene and Benhart 1992). These ñcommutersò have second homes in the mountains, hunt in the woods, go boating on the Potomac, or go skiing at one of the three ski resorts. They take daytrips to the Civil War battlefields and Harpers Ferry National Historical Park, or go to the expansive Hollywood Casino at the Charles Town Races (WV). Many metropolitan residents also attend the various large apple-themed festivals held in the Fruit District. The festivals would not be as successful and the Casino and ski resorts would not be viable without the support from the recreational commuters.

Job opportunities in the Shenandoah-Cumberland Valley Fruit District have significantly increased. The region has a manufacturing sector that produces car parts, plastics, building products, cranes, and food products. A large printing industry also exists (HEDC 2011; WFCEDC 2011; BCDA 2012; FCADC 2012). Limestone is quarried and processed into cement products in the Shenandoah Valley while silica sand is mined to the west in the Appalachian Ridge and Valley province. Large employment sectors common to all counties include the health professions, local school districts, and local government. These service-related jobs have increased with the rise in the local population. Many of the regional medical centers have been in expansion mode. As the population continues to grow, more retail establishments have opened including many national chains. Another industry that has benefited from the demand from a growing population is the construction and home improvement industry. Despite the recent economic recession, building still continues in the region, albeit at a slackened pace.

Employment in higher education is important in some locales with Harrisonburg (VA), Shippensburg (Franklin and Cumberland counties, PA), and Shepherdstown (Jefferson County, WV) being college towns. In addition, the Fruit District contains a number of long-time military establishments. For example, the military installations in the Pennsylvania section of the Cumberland Valley employ 13,800 contractors, civilians, and military personnel (FCADC 2006).

Other job sectors are a direct result of the increasing interconnectedness with Washington, D.C. and other East Coast population centers. In addition to lower median housing values, the Shenandoah-Cumberland Valley Fruit District has lower median household income, lower educational attainment, and an overall lower wage structure than the Washington metropolitan area (Table 6.2). These regional demographic attributes have attracted back-office jobs (*Herald-Mail* 2010). With over 2,000 employees each, two credit card customer service centers near Hagerstown (MD) are among the largest private employers in the area (HEDC 2011). The political influence of West Virginiaôs former Senator Robert C. Byrd garnered a large number of federal back-office jobs for West Virginiaôs Eastern Panhandle. These facilities include computing centers in Berkeley County (WV) for the Internal Revenue Service, the Coast Guard, and the Bureau of Alcohol, Tobacco, and Firearms. Senator Byrdôs influence also helped Jefferson County (WV) to obtain new training centers for the U.S. Fish and Wildlife Service and the U.S. Customs and Border Patrol (*Herald-Mail* 2010).

Reflecting the Valleyôs incorporation into Megalopolis, large distribution plants have taken advantage of the relatively cheap, flat land to supply customers via Interstates

81, 70, and 66. Interstate 81 in particular is a major north-south trucking corridor that is used to avoid the congestion of Interstate 95 (Greene and Benhart 1992). At least 19 large distribution centers are now located along the I-81 corridor in Franklin (PA), Washington (MD), and Berkeley (WV) counties (HEDC 2011; BCDA 2012; FCADC 2012). The Target distribution center in Chambersburg (PA) provides a good example of the connection with other East Coast population centers besides the Baltimore-Washington, D.C. area. The trucks I loaded there in the early 2000s were all servicing Target stores in central and eastern Pennsylvania, New Jersey, and the New York City area.

Many of these new places of employment tend to cluster in industrial parks or stand-alone near the highways and interstates (Lewis 1995). Much of the recent retail development is on the outskirts of the small cities. The downtowns in both Martinsburg (WV) and Hagerstown (MD) are struggling with high retail vacancy rates. Residential growth has been occurring on the outskirts of the cities and towns and also in rural subdivisions of varying densities. Some subdivisions feature expensive homes with large lots while others are quite dense and look out of place when surrounded by farmland. The high-growth, low-density, and strong commuting ties with larger urban areas that defines exurbia is characteristic of the settled landscape of Jefferson County (WV), southern Adams County (PA), eastern Washington County (MD), and parts of both Berkeley County (WV) and Frederick County (VA) (Berube *et al.* 2006).

In 1967, a Martinsburg (WV) *Journal* newspaper reporter wrote ñour main highway routes ï U.S. 11 and State Routes 9 and 45 ï are almost ómain streetsô in

themselvesò (Doherty 1972, 361). The Berkeley County Comprehensive Plan from that same year noted that ñBerkeley found itself caught up in change because she was part of a new type of spread urban region covering many square miles and interlaced with high speed highwayò (Doherty 1972, 362). This early description of the urban functionality of these ñruralò roads was later defined by geographer Peirce Lewis (1995) as the ñGalactic Cityò due to the expansiveness of this new urban form. It is appropriate that he used Jefferson County (WV) and Adams County (PA) in his description of the connectivity between the city, suburbs, and exurbs. Above all, the Galactic City is a consumer of land; land that is valued for its potential urban use and not for its agricultural production.

Impact of Area Growth and Development on the Fruit Industry

Like many places, growth and development in the Shenandoah-Cumberland Valley has been spatially uneven. Some areas of the Fruit District are experiencing more development pressures than others. This section examines the growersô perception of the intensity of development in their area and the impact new growth has been having on their operations. A growerôs impression about the level of development pressure is important because of the influence this perception could have on the decision to reinvest in his or her operation.

In the mail survey, growers were asked to rate whether they considered the development pressures over the past 15 years in their area as high, medium, or low. Development pressure was defined on the survey as an increase in local population, rising land values, and new residential or commercial projects. The 15-year time span was given because I wanted the growers to reflect back on the high-growth years and not the

just the recent recession-driven housing downturn. ñAreaò was left undefined and subject to each growerôs interpretation. It is important to remember that not all land is valued for development and that the question refers to the generic ñareaò and not the growerôs specific parcels of land. An average was derived by assigning numerical values to each response option where High = 3, Medium = 2, and Low = 1.

The majority of growers in the Fruit District describe their area as having experienced high development pressure (Table 6.4). Less than 10 percent indicated that the development pressure in their area was low. The average development pressure score for the entire Fruit District was 2.5 out of 3. West Virginiaôs 2.84 was the highest average of all of the sub-regions. Almost 84 percent of the West Virginia respondents reported high development pressures in their area. West Virginia was the only sub-region where no growers selected low development pressure. West Virginiaôs results are not surprising as the sub-region has had the fastest rate of population growth in the past decade (Table 6.5). Berkeley (WV) and Jefferson (WV) counties experienced a significant housing boom in the early-to-mid 2000s (Figure 6.2). In the past decade, Berkeley County led the counties of the Fruit District in the rate of population growth and actual number of new residents (Table 6.1). One of the main reasons underlying Berkeley Countyôs high population growth is the developer-friendly climate. The county has no zoning regulations and no impact fees for new development. The lower restrictions pulls development to Berkeley County that otherwise would have been built in other counties. An attempt to initiate county-wide zoning was soundly defeated by a two-to-one margin by the countyôs voters in 2008 (Umstead 2008).

Table 6.4 Growers' Rating of Development Pressures over the Past 15 Years

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
High	56.0%	38.3%	55.6%	83.9%	65.2%
Medium	37.6%	53.3%	37.0%	16.1%	26.1%
Low	6.4%	8.3%	7.4%	0%	8.7%
Average	2.50	2.30	2.48	2.84	2.57

Note: Averages in last column were computed where 3 = High, 2 = Medium, and a 1 = Low

Source: Authorôs Mid-Atlantic Apple Survey

Table 6.5 Fruit District Sub-Region Population and Apple Acreage Change 2000–2010

	Population Change 2000-2010	Percentage Population Change	Apple Acreage Change 1997-2007	Percentage Apple Acreage Change
Adams County	10,115	11.1%	ï 4,111	ï 24.9%
Cumberland Valley	58,544	12.3%	ï 2,262	ï 37.9%
West Virginia	45,931	30.0%	ï 5,152	ï 54.5%
Virginia	47,049	19.7%	ï 6,584	ï 42.4%
Total	**160,639**	**16.8%**	**–18,109**	**–38.2%**

Source: U.S. Census Bureau; USDA *Census of Agriculture*

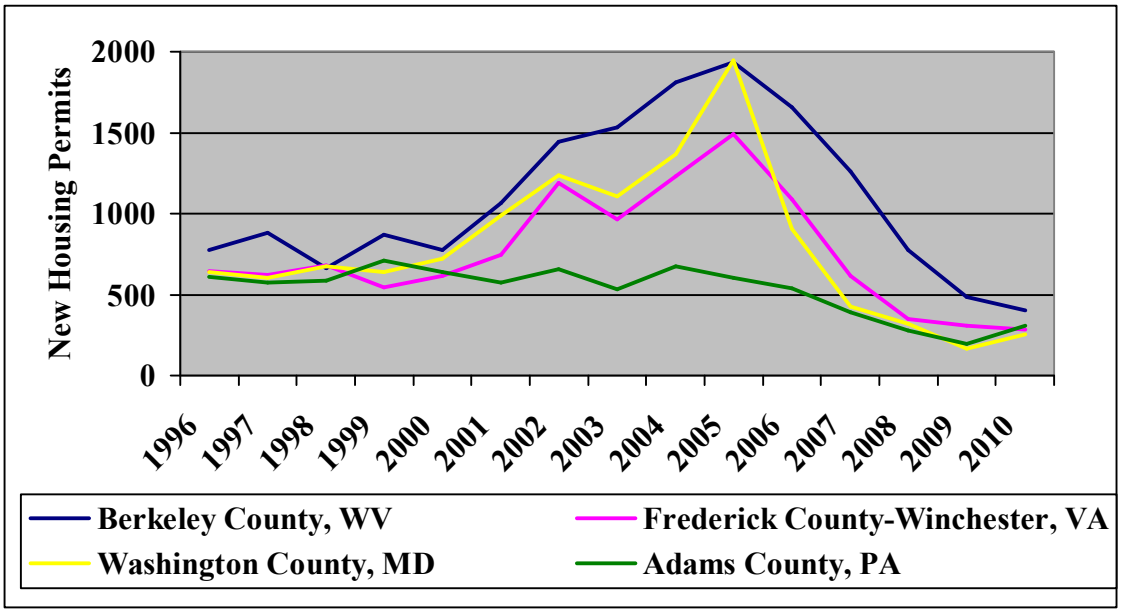


Figure 6.2 Building Permits for New Privately-Owned Residential Housing Units

Note: Statistics represent authorized building permits granted for new housing only. It does not represent actual new housing starts.

Source: U.S. Census Bureau, *Building Permits Survey*

During this period of high population growth in the Eastern Panhandle, many former orchards have been converted to residential or commercial uses. From 1997ï 2007, the West Virginia sub-region lost the highest percentage of its apple acreage (Table 6.5). The northern quarter of Berkeley County has had more than ten residential subdivisions carved out of orchards. Some of these subdivisions even have left over apple trees in the front and back yards of the new houses. Apple Pie Ridge, the site of many orchards, has also attracted many new subdivisions because of the appealing landscape and accessibility to Interstate 81 (Figure 6.3; Figure 6.4). In Jefferson County (WV), the 3,200 unit New Urbanist-styled Huntfield subdivision is located on the site of a former 1,000 acre orchard that had been planted in corn and soybeans for 20 years prior to its conversion to residential use. Unlike other developments, the developer of Huntfield has removed topsoil and deeper soils at the former orchardôs chemical mixing sites to gain certification that the land is ñcleanò of lead arsenates, DDT, and other toxins (McMillion 2005). Even Hampshire County, an area outside the Washington, D.C. commuting zone, has had many of its former orchards converted to housing.



Figure 6.3 New Residential Development in the Orchard Areas of the West Virginia Sub-Region

Top ï A new housing development on the site of a former apple orchard located on Apple Pie Ridge; Berkeley Co. WV *Bottom* ï Aerial view of a new housing development built within an orchard; Jefferson Co. WV

Top Photograph by Joseph P. Guttmann Bottom aerial view from Mapquest.com

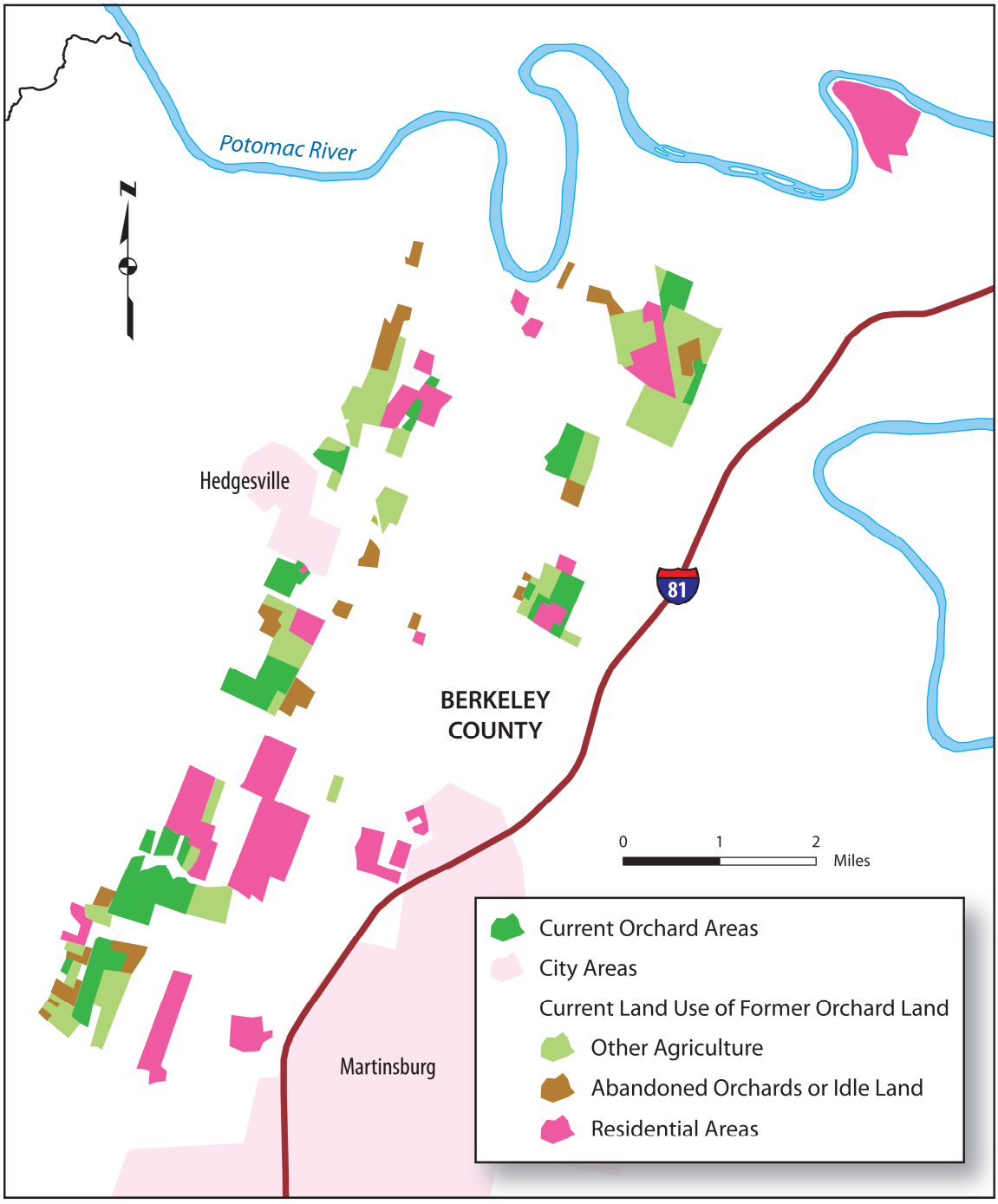


Figure 6.4 Map of Orchard Land-Use Change in Northern Berkeley County, West Virginia

Map by Will Fontanez and Joseph P. Guttmann

The Virginia sub-region had the second highest average development pressure score (Table 6.4). Over 65 percent of Virginian growers rated development pressures in their area as being high. In the past 10 years, the sub-region has had the second highest population growth rate (Table 6.5). Development pressures have been most acute in the northern Shenandoah Valley. Further south, the apple-growing areas in northern Rockingham County (VA) and southern Shenandoah County (VA) are in rural locales. The majority of the growers in Rockingham County (VA) thought development pressure was ñmediumò in intensity.

Like Berkeley County (WV), Frederick County (VA) experienced a housing boom in the mid-2000s (Figure 6.2). Residential and commercial growth on the western outskirts of Winchester (VA) and Stephens City (VA) is coming into contact with land used for apple orchards. Large apple orchards are located immediately to the west of the limited-access Route 37 Bypass around Winchester and there is even substantial apple acreage located between the bypass and Winchester proper (Figure 3.7). Originally built in a rural area, the Route 37 Bypass will continue to induce demand for further development in the future. The apple-growing region in the Valley beyond the Winchester environs has attracted some subdivisions but still retains its rural feel. Housing in this area of Frederick County (VA) can command a high price as one new development on Apple Pie Ridge advertises houses from the upper $400,000s. A stretch of road west of Stephens City (VA) further highlights the dichotomy of choices available to local growers concerning land use. On one side of the road is Apple Banks South, a former orchard converted to a subdivision advertising luxury homes starting from the

upper $600,000s. The subdivision has new, large brick homes that abut an apple orchard at the backyard property lines. Meanwhile, another grower across the street has reinvested in his or her orchard operation by planting new trees.

Historically, many of Clarke Countyôs (VA) large orchards were located adjacent to the county seat of Berryville. As the town has grown from a population of 2,963 in 2000 to 4,185 in 2010, some of the orchards bordering the town have been converted to housing and other urban uses (U.S. Census Bureau 2011). Interestingly, many of the more recent orchard conversions have been to other agricultural uses such as corn, soybeans, Christmas trees, and nursery plants for landscaping (Edwards 2004; Withers 2005; Mangino 2006b). Today, Clarke Countyôs largest orchard still in production is hemmed in by houses and the county high school (Figure 3.7).

The average development pressure score for the Cumberland Valley sub-region was the same as the Fruit Districtôs as a whole (Table 6.4). The impact of development on orchards in the sub-region has been mixed. The growers in northern Franklin County (PA) and the Valley section of Cumberland County (PA) reported medium or low development pressure. An upscale, rural subdivision has replaced a large orchard block in the North Mountain Fruit Belt west of Chambersburg (PA) and former orchards have been developed in an area near Interstate 81 north of Chambersburg (Figure 3.10). Other former orchards in Franklin County (PA) have been converted to other agricultural uses or left fallow, even when sited near urban areas. Across the state line, housing growth boomed in Washington County (MD) in the early-to-mid-2000s to the point that a building moratorium was in place from 2002ï 2005 (Figure 6.2). The moratorium

prevented subdivisions that contain more than six houses from being built in designated rural areas (Reilly 2005). Smithsburg (MD), the main apple-growing area of Washington County (MD), has retained most of its apple acreage. This is surprising because the eastern Washington County town is within a convenient commuting distance to the Washington-Baltimore metro area and has attracted several large subdivisions (Semler 2010).

Adams County (PA) is the only county in the Shenandoah-Cumberland Valley Fruit District where the majority of the respondents described the development pressures as medium in intensity (Table 6.4). Since 1980, the population has risen 48.5 percent which is a higher growth rate than the Cumberland Valleyôs 31.4 percent but lower than West Virginiaôs 94 percent and Virginiaôs 69.5 percent (Table 3.6). While Adams Countyôs growth rate over the past 10 years was still higher than the 9.8 percent national growth rate, its rate of growth since 2000 was the lowest of the Fruit Districtôs sub-regions (Table 6.5). Adams Countyôs growth has been steady but it did not experience the early-to-mid 2000s housing boom to the same extent as did the other counties in Figure 6.2.

One major influence on growth rates is Adams Countyôs lack of an interstate highway. The county has not attracted the distribution centers, factories, and other commercial job creators as has those counties in the I-81 corridor (Figure 6.1) (Source 1103 2010). Adams County also has less of a commuting connection to Washington, D.C. and its Maryland suburbs than the Cumberland Valley and West Virginia sub-regions (Zones 2 and 3 in Table 6.3). Much of the growth in Adams County has occurred

in the southern and eastern sections of the county and not in the South Mountain Fruit Belt (Figure 3.3) (Kuhn 2010; NACJCP 2010). New rural subdivisions are rare in the South Mountain Fruit Belt when compared to the fruit-growing areas in the Virginias. While both the South Mountain Fruit Belt in Adams County (PA) and Apple Pie Ridge in Berkeley County (WV) have attractive, hilly landscapes with mountain ridge views, Apple Pie Ridge has seen more residential development pressure because of its easy access to Interstate 81 and Berkeley Countyôs (WV) less restrictive land regulations. Perhaps the distance from the South Mountain Fruit Belt to the job centers in the Washington-Baltimore metropolitan area is just out of range for most peopleôs comfort (Figure 6.1). Most residents of the Fruit Belt work within the Fruit Belt or in the Gettysburg (PA) area. Compared to the rest of Adams County, residents of the Fruit Belt are less likely to commute to jobs outside of Pennsylvania and less likely to commute to jobs that are more than one hour distant from their residences (NACJCP 2010). These commuting patterns could change in the future. As Frederick County (MD) continues to attract jobs and transitions to becoming more similar to high-priced Montgomery County (MD), it is likely that the demand for prime developable land in the South Mountain Fruit Belt will increase.

Because the impact of growth and development affects each grower differently, the surveyed growers were presented with a list of ways development could impact farming and asked to select each option that applied to their own situation. The most commonly selected option was that area growth and development had made it more difficult for those wanting to expand production through the purchase of new land (Table

6.6). With the demand for housing and other non-farm uses increasing the price of farmland that is suitable for development, at some point, the price of land outweighs the potential economic return from agriculture (Bennett 2004; Edwards 2004; Semler 2010). One grower noted that rising land prices has even made it difficult to purchase land from his own family because they expect to be paid the full value of the land too (Glaize 2010a).

Table 6.6 Survey Question: How has development in your area impacted your business?

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Makes it difficult to purchase new land	51.4%	56.9%	51.9%	45.2%	45.5%
Affects decision whether to replant or not	34.1%	22.4%	33.3%	48.4%	45.5%
Increases equity in the farm - easier to obtain loans	31.2%	29.3%	18.5%	25.8%	59.1%
Increases likelihood of selling the farm	40.6%	29.3%	44.4%	51.6%	50.0%
Increases retail sales on farm	26.1%	15.5%	29.6%	32.3%	40.9%

Note: Percentages will not add up to 100 percent. Growers were allowed to select more than one statement.
Source: Authorôs Mid-Atlantic Apple Survey

Leasing land is another fairly common option for growers who want to expand their operations. Leasing land for orchards is more prevalent in Virginia than in the other sub-regions (Table 6.7). Some of the available land for lease is from former growers. For example, six former growers from Virginia commented on the survey that they were now retired and leasing their orchards to other growers. While leasing is less expensive than purchasing land, a growerôs long-term access to the land parcel is less secure, especially in the face of rising land values (Bunce 1985; Bryant and Johnston 1992; Smithers and Johnson 2004). Ultimately, the land-use decision is made by the property owner and not the lessee. Many growers are very concerned or somewhat concerned about their long-term access to leased land. One orchard partnership even underlined and added three exclamation marks to the ñvery concernedò option because they lease all of their land. Another grower said that he is unsure whether the families that he rents land from would be willing to re-sign another long-term lease when it comes time to replant the orchard. He notes, ñTo plant an orchard, I would want 30 years. Itôs very hard for (the owners of the land) to commit that longò (Glaize 2010a).

Table 6.7 Survey Question: If you lease land from others, how concerned are you in maintaining long-term access to that land parcel?

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Very concerned	13.4%	16.4%	0%	16.1%	17.4%
Somewhat concerned	19.7%	14.8%	22.2%	19.4%	30.4%
Not concerned - I have a stable, long-term agreement	7.0%	6.6%	7.4%	3.2%	13.0%
Not concerned - I can easily rent land elsewhere	2.1%	4.9%	0%	0%	0%
I do not rent land from others	57.1%	57.4%	70.4%	61.3%	39.1%

Source: Authorôs Mid-Atlantic Apple Survey

Around one-third of the survey respondents said that development in their area affects their replanting decisions (Table 6.6). The decision to replant is a long-term commitment and some growers may be in the position of weighing their options to reinvest in their operation or accept an offer on their land. Interestingly, 60 percent of the growers in Virginia and West Virginia with more than 200 acres in apples said that development affects their decision to replant while only 6.7 percent of large-acreage growers from Pennsylvania said the same. This could be because more large growers in the Virginias felt higher development pressures and were more reliant on rental land than their Pennsylvanian counterparts.

Slightly more than 40 percent of the respondents reported an increased likelihood of selling their farm because of the development in their area (Table 6.6). The affirmative answers from growers in the Virginias outpaced Adams County by over 20 percent. The difference between large growers in the Virginias and large growers in Pennsylvania was 46.7 percent to 6.7 percent. Growers were also asked what they thought the likelihood of their land staying in agriculture would be in the event that that the farm was sold (Table 6.8). Almost 30 percent thought it was highly likely that their land would stay in agriculture while 38 percent were ñunsure.ò Growers were not asked whether their land was in a land preservation program although several mentioned that fact in the survey comments section. ñPreservedò farms are guaranteed to remain in agriculture or lie fallow. On the other hand, one-third of the respondents replied that their land would not likely stay in agriculture if their farm was sold. Once again, there was a large, 30 percent difference between attitudes in the Virginias versus the attitudes in Adams County (PA).

While Table 6.8 posed a hypothetical question, 25.4 percent of the respondents reported that they have actually sold land for non-agricultural uses in the past 15 years. Those growers selling land for non-agricultural purposes range from 14.8 percent of Adams County growers to 50 percent of Virginia growers. The Cumberland Valley and West Virginia sub-regions fell within this range with 24 percent and 30 percent respectively.

Table 6.8 Survey Question: If you decide to sell your farm in the future, what is the likelihood that the land would continue to be used for agriculture?

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Highly likely	28.2%	38.7%	25.9%	16.1%	18.2%
Unsure	38.0%	41.9%	40.7%	35.5%	27.3%
Not likely	33.8%	19.4%	33.3%	48.4%	54.5%

Source: Authorôs Mid-Atlantic Apple Survey

Obviously, not all land sold is converted to non-agricultural uses. Land is also sold to be used for orchards or other agricultural purposes. However, as Table 6.9 shows, more growers have sold land for non-agricultural uses than for agricultural purposes. Around 11 percent of land was sold for other less intensive agricultural uses such as row cropping, hayfields, and pasturage for beef cattle. Very few growers have sold land that was later used for orchards. Adams County was the only sub-region where land was as likely to be used for orchards as it was for new housing. This contrasts with the Virginia sub-region where over 40 percent of land that was sold was used for housing and another 13.9 percent used for commercial purposes.

Table 6.9 Survey Question: If you are a former grower or a current grower who has sold a significant amount of land, what was the land used for after it was sold?

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Orchards	5.0%	8.1%	3.7%	0%	4.5%
Corn or other crop	6.4%	4.8%	14.8%	3.3%	4.5%
Hay, pasture, beef cattle, or vacant	5.0%	4.8%	3.7%	3.3%	9.1%
Housing	22.2%	8.1%	25.9%	33.0%	40.9%
Commercial use	7.1%	3.2%	7.4%	10.0%	13.6%
Sold no land	66.7%	79.0%	63.0%	56.3%	50.0%

Note: Percentages will not add up to 100 percent. Growers were allowed to select more than one statement.
Source: Authorôs Mid-Atlantic Apple Survey

Growth and development in an area can also help a growerôs bottom-line without the grower having to sell land. Rising land values increase the equity in a farm when the grower owns the land (Glaize 2010a). Most growers obtain a loan in the spring and use that money for operations throughout the year. Because no bank is going to secure a loan based on apples hanging from a tree, the loan is leveraged against the growerôs land (Bryant and Johnston 1992; Semler 2010). Increased equity helps the grower obtain loans at better terms for farm operations or enables the grower to access needed capital for farm reinvestment. Obtaining loans is not always easy, especially when the apple

industry as a whole is experiencing financial difficulties. As one grower said, ñIôve been thrown out of banks and I have been welcomed into banksò (Source 1103 2010). Around 30 percent of the Fruit Districtôs growers indicated that rising land prices has increased their farm equity making it easier to obtain loans (Table 6.6).

Another way that some growers have benefited from growth and development in their area is through increased on-the-farm retail sales. Population growth means that there are more potential farm market customers. As one extension agent observed, based on the size of the houses being built, many of the newcomers to Washington County (MD) have disposable income and are not as concerned about the price of food. The new residents seem interested in purchasing food from the farm stands because it is locally-produced (Semler 2010). In northern Berkeley County (WV), a key reason behind Kitchenôs Orchards decision to build a new, larger farm market building was the proposed 750-unit development slated to be built next to the farm. The orchard wanted to position itself to benefit from the future growth instead of waiting to expand until after the houses were already built (Kitchen and Boarman 2010). As seen in Table 6.6, only a quarter of growers have experienced an increase in on-the-farm retail sales because of development in the area. The low percentage is partly because many growers do not have on-the-farm retail sales. When only including those who have retail stands, 62 percent of the Fruit Districtôs growers experienced increased retail sales because of new development in their area.

Several issues that concern the impact of growth and development on orchard operations were not covered on the survey but were brought up in the interviews. A few

growers mentioned that when the construction industry was strong prior to the economic recession, attracting and keeping labor was a major concern (Glaize 2010a; Kearns 2010). When asked how area development has affected their operation, several growers initially said that development has had little impact but then went on to cite traffic concerns and the compatibility of farming practices near housing (Kuhn 2010, Miller 2010; Source 1103 2010). Growers with dispersed parcels of orchard land noted that increased traffic on rural roads has become a safety issue and slows the movement of equipment between orchards (Kuhn 2010; Source 1103 2010). Relationships with neighbors over certain farming practices can sometimes be problematic. For example, a growerôs neighbor complained that the mice bait in the orchard might poison the family dog (Kitchen and Boarman 2010). Growers also have had to be more cognizant of wind drift when spraying around houses or busy roads (Figure 6.4) (Kearns 2010; Kuhn 2010, Miller 2010). One grower mentioned that he now sprays more at night to lessen the chances of spray drift (Kitchen and Boarman 2010). Another grower feels that agriculture and people from non-agricultural backgrounds just do not mix, so he will not lease land in areas with too many nearby houses (Source 1103 2010).



Figure 6.5 Grower-Neighbor Relations

Left - When houses abut orchards, growers need to be more aware of wind drift when spraying pesticides; Berkeley Co. WV *Right* – A growerôs warning sign posted near new housing across the street from the orchard. ñNotice – Neighbors be Advised, Restricted use crop protection chemicals are applied regularly during the growing season. Be prepared for noise, odors, and dust;ò Washington Co. MD
Photographs by Joseph P. Guttmann

The impact of a rising population and the decline in apple acreage on the industryôs support businesses has been mixed. One of the most important consequences of increased development in the region has been the rise in the cost of orchard inputs. As growers have gone out of business or have sold land for housing, the critical mass of customers needed to support fruit-related businesses has suffered, especially in the Virginias. Having fewer growers in a region has resulted in higher prices for agricultural chemicals and other specialized orchard inputs for the remaining growers (Kearns 2010; Source 3199 2010). Some companies have had to diversify their business plans. For example, apples now account for only 28 percent of Winchester Cold Storageôs business and Virginia Storage has added dry storage to their storage inventory (Vaden 2009).

Winchester Equipment Company, a supplier of agricultural equipment and parts, has actually seen its business increase with the mid-2000s construction boom (Edwards 2004). On the other hand, the conversion of orchard land played a major role in the decision to shut down Knouseôs Inwood plant in southern Berkeley County (WV). Ken Guise, the CEO of Knouse Foods, stated that ñhousing developments now stand where orchards once were and thereôs been a continuing decline in cases produced at the plant, a function of fewer apples receivedò (Cox 2008). The former applesauce factory is currently being used as a church called the Connections Community Church at the Plant (Figure 6.5).



Figure 6.6 Closed Plant

Left ï Knouse Foods Inwood, WV plant in 2004. After 75 years, Knouse ceased applesauce production in 2008; Berkeley Co. WV *Right* ï Same sign in 2011, part of the former Knouse plant is now being used for church services.

Photographs by Joseph P. Guttmann

Effects of the Economic Recession

When I first started this dissertation project, many places within the Shenandoah-Cumberland Valley Fruit District were in the midst of a housing and property-value boom. Building permits for new houses peaked in 2005 but the housing industry did not experience major difficulties until 2007 (Figure 6.2). Since the crash of the financial and real estate markets in the fall of 2008, building, hiring, and the overall business climate in the nation and Fruit District have been slow. One of the most important effects of the popping of the housing bubble has been the lowering of property values. While property values are still much higher than in the late 1990s, those that bought property during the mid-2000s boom have seen their investments drastically decline in value. For example, a 99-acre former dairy farm, located a few miles from the orchard district of Washington County (MD), was sold for $1,450,000 ($14,650 per acre) in 2006. In 2010, the investors took the property off the auction block when no bids higher than $320,000 ($3,230 per acre) were received. The investors had originally planned a 22-home subdivision but only received bids from people wanting to use the land for agriculture. The large difference between the per acre selling price in 2006 and the failed bid in 2010 represents the difference between the one-time development value of the land and its current agricultural valuation (Platou 2010).

The economic recession also delayed or killed several proposed large-scale developments slated to be built on orchard land. In 2004, a 750-home development was proposed on land owned by Winchester Cold Storage adjacent to the Huntfield development in Charles Town (Jefferson County, WV). Had the development been built,

the fruit storage facilities would have been torn down (Slavin 2004). Large developments were also proposed for the orchards formerly owned by National Fruit Product Company in Berkeley County (WV). A 750-unit development was proposed for the 300-acre orchard in northern Berkeley County (Kitchen and Boarman 2010). Today, the former orchard consists mostly of corn, soybeans, a few newer trees that are rented out, and a block of overgrown, abandoned trees. A planned 3,550-unit development was also never built on a 1,100 acre orchard tract owned by National Fruit in southern Berkeley County (Smoot 2007). While some of this land has been planted in corn, much acreage is still being maintained as orchard and there have been some new tree plantings. Six proposed subdivisions with over 1,100 housing units were also never built in the Northwest Adams County (PA) planning district, the core of the South Mountain Fruit Belt (NACJCP 2010).

On the survey, growers were asked how the financial crisis affected their decision-making (Table 6.10). I was surprised that nearly half the respondents indicated that the financial crisis had not had a major impact on their business. Delaying planned improvements or not purchasing new equipment was noted by 35 percent of the growers. Not on the survey, but important, was the lessened competition from construction and other job sectors for orchard labor (Glaize 2010a; Kearns 2010).

Table 6.10 Survey Question: How has the current financial crisis influenced your decision-making?

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Obtaining financing is more difficult	25.0%	25.4%	18.2%	28.6%	27.8%
I have delayed planned improvements ï new buildings, equipment...	35.0%	35.6%	34.6%	33.3%	33.3%
I am more likely to sell land	17.5%	10.2%	27.3%	23.8%	22.2%
I am less likely to sell land	14.2%	6.8%	13.6%	23.8%	27.8%
I will increase my production of apples	6.7%	8.5%	4.5%	9.5%	0%
It has improved local retail sales of apples	20.8%	16.9%	22.7%	28.6%	22.2%
The financial crisis has not had a major impact on my business	46.7%	42.4%	59.1%	52.4%	38.9%

Note: Percentages will not add up to 100 percent. Growers were allowed to select more than one statement.
Note: Current growers only

Source: Authorôs Mid-Atlantic Apple Survey

A Comparative Advantage Lost

Unlike the orchard operations located in the Shenandoah-Cumberland Valley that have been dealing with rising property values, the decline of apple acreage in Morgan County (WV), Hampshire County (WV), and western Washington County (MD) in the late 1970s through the early 1990s had more to do with the loss of a comparative advantage in the marketplace (Miller 1993c; Baugher 2010; Marini 2010; Semler 2010). Between 1982 and 1987, Morgan County (WV) lost 958 acres (62.3 percent of its apple acreage) and Washington County (MD) lost 2,466 acres (54.0 percent of its apple acreage). Hampshire Countyôs (WV) apple acreage declined by 62.4 percent, or 2,325 acres, between the 1987 and 1992 Census of Agriculture (Figure 6.7; Table 3.3).

Large-scale apple orchards have a long history in the Appalachian Ridge and Valley section of the Shenandoah-Cumberland Valley Fruit District. Around the time of World War I, the Leatherman Orchard, partly located in Hampshire County (WV), was the largest individually-owned and operated orchard in the nation (Machemer and Miller 1993). As late as 1991, the Mt. Levels Orchard in Hampshire County (WV) was the 16th largest apple orchard by acreage in the United States (*American/Western Fruit Grower* 1991). Apple acreage in western Washington County was large enough to justify the University of Maryland establishing a fruit research lab in the town of Hancock (MD) (Harrison 1987; Semler 2010).

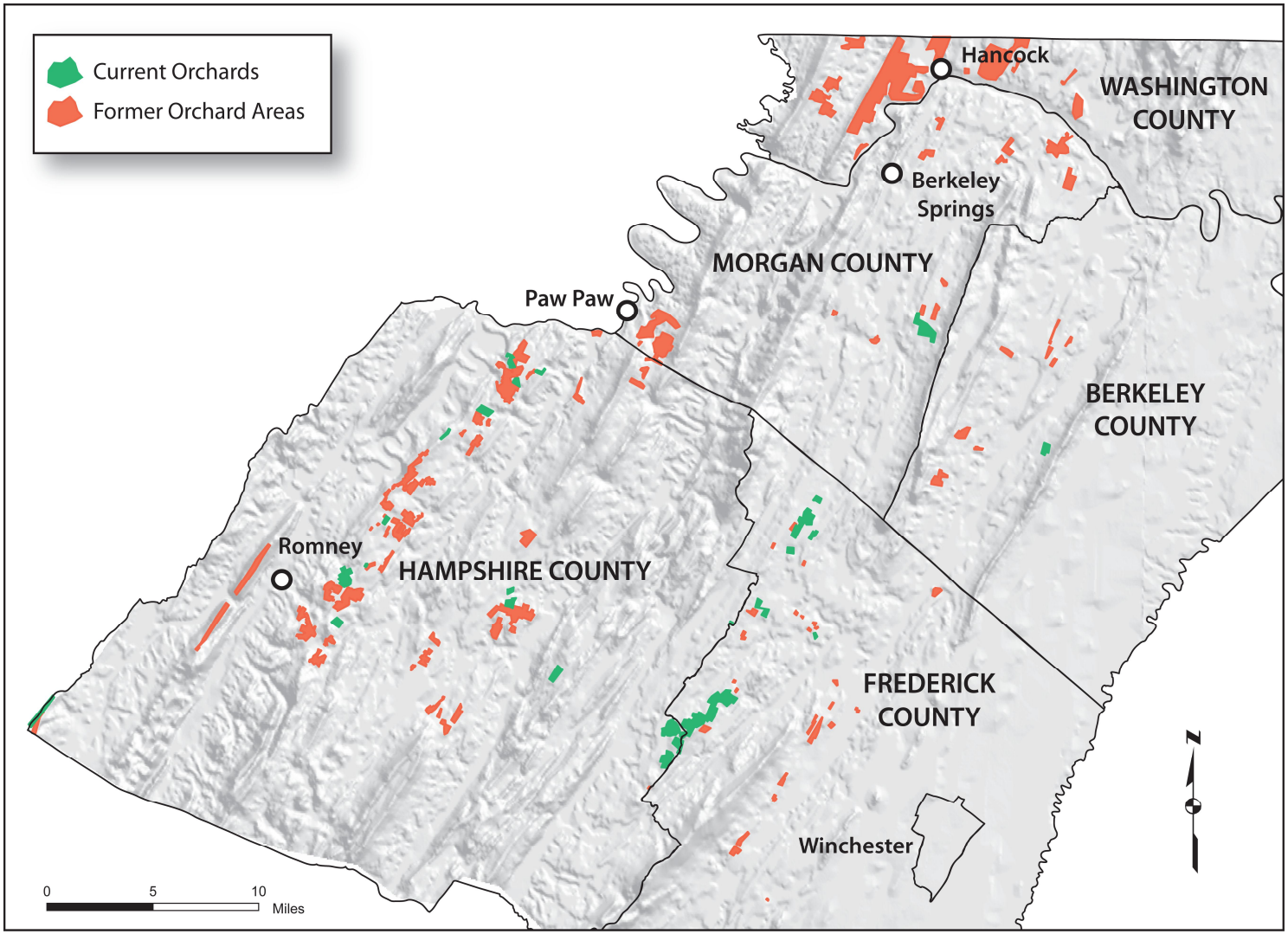


Figure 6.7 Map of Orchard Loss in the Appalachian Ridge and Valley Province

Map by Will Fontanez and Joseph P. Guttmann

Many of the mountain orchards hugged the ridge tops and some trees were even grown on man-made terraces. The ridge top positions and high altitudes of the mountain orchards lessened the potential for frost damage and the poor, shallow soils acted as a natural control for tree vigor. Comparatively, the mountain orchards were able to produce apples that were firmer, had higher sugar levels, and had more consistent and better red coloring than apples produced in the fertile soils of the Valley (Miller 1993a, 1993c; Baugher 2010; Marini 2010). The mountains also had a large, local, and inexpensive seasonal labor supply readily available (Miller 1993c).

With the development of dwarfing rootstocks to control tree vigor and the development of newer strains of apples enabling better-colored apples to be grown everywhere, the mountain orchards lost their competitive advantage. It is now easier to get good coloring at lower elevations and the fertile soils of the Valley produce much higher yields and larger fruit than the cherty soils of the mountains (Miller 1993c; Baugher 2010; Marini 2010; Source 3199 2010). In addition to low yields, the difficulty of orchard management on hillsides and the increasing scarcity of local labor raised costs.

By the mid-1980s, several orchards that had once had over 1,000 acres in apples had been sold or went out of business (Miller 1993b,1993c; Baugher 2010). The town of Paw Paw in western Morgan County (WV), which had three packinghouses and six nearby orchards, no longer has any commercial orchards in its vicinity (Figure 6.7) (Evans 2011). The death knell for the townôs apple industry came when the Potomac River Flood of 1985 destroyed the packinghouses and the controlled atmosphere storage facilities (Baugher 2010). Likewise, no commercial orchards are left in western

Washington County (MD). The University of Maryland fruit research lab closed in the early 1980s and only an apple cold storage facility in Hancock (MD) remains in operation (Harrison 1987).

The decreased profitability caused by the loss of the mountain orchardsô comparative advantage in the market was compounded by the specific problems of individual operations. For example, the largest orchard operation in western Washington County (MD), owned by an absentee German owner, decided to get out of the business because of a labor issue. According to Jeff Semler, a long-time Washington County (MD) extension agent, the orchards were not profitable enough to compensate for the regulatory hoops that the company had to jump through, so the company just said they were done (Semler 2010). The mountain orchardsô lack of profitability also did not entice the next generation to take over the family business. Several very large orchard operations went out of business when the owner retired or passed away (Baugher 2010; Semler 2010). A current grower from Hampshire County (WV) attributes the areaôs decline to a lack of successors, poor prices, and, in some cases, poor management (Shanholtz 2010). Today, the former orchard land in Hampshire (WV), Morgan (WV), and western Washington (MD) counties has been converted to housing, is used for cattle pasture, gets cut for hay, or lies fallow with isolated fruit trees still standing. The abandoned orchards have caused problems for current growers with adjacent working orchards because the abandoned orchards attract deer and pests (Source 3199 2010).

The Apple Industry's Impact on Regional Identity

Distinctive regions are formed by the blending of an areaôs history, cultural patterns, economy, and visual landscapes (Coggeshall 1996). Historically, the fruit industry was a prime economic driver in the Shenandoah-Cumberland Valley and, despite the loss of nearly one-half of its apple acreage, orchards are still prominent on the agricultural landscape. For some communities, the importance of the apple industry in the formation of local identity is made visibly apparent by the symbols the community uses to define itself to outsiders. For example, drivers traveling on Interstate 81 will see an apple painted on large water towers in Berkeley County (WV) (Figure 6.8). Mt. Jackson (VA), home of Bowman Apple Products, also has a very prominent water tower next to Interstate 81 painted to look like a bushel basket of apples. Although there are no longer any commercial orchards near Hancock, MD, the town pays homage to its past by planting several apple trees behind its ñWelcome to Hancock, Marylandò sign. Both Winchester (VA) and Martinsburg (WV) have giant red apples displayed in their downtowns (Figure 6.8). Winchester has an additional 19 painted apples displayed throughout the city from a 2005 art project (Behofist 2012). A sign outside of Biglerville (PA) proclaims that Adams County town as the ñApple Capital USAò while a sign for the Frederick County (VA) Growers Association touts Winchester as the ñApple Capital of the World.ò Images of the fruit industry are also being used for promotional materials. For example, peach blossoms and a red apple adorn the front and back covers of the booklet used by the Martinsburg-Berkeley County Chamber of Commerce to promote the area to potential outside investors and new residents (Figure 6.8).



Figure 6.8 Symbols of Regional Identity

Top ï Water tower seen from Interstate 81; Berkeley Co. WV *Center Left* ï Red apple time capsule in downtown Martinsburg; Berkeley Co. WV *Center Right* ï Winchester, VA, ñThe Apple Capital of the Worldò Bottom ï Back cover of the Martinsburg and Berkeley County Chamber of Commerce booklet
Photographs by Joseph P. Guttmann

The impact of the apple industry appears in other forms of local identity as well. Many non-fruit-related businesses use apple references in their names. Examples include Winchesterôs (VA) Apple Blossom Mall, Martinsburgôs (WV) Apple Valley Chevrolet, and Arendtsvilleôs (PA) Apple Country Tanning. Many subdivisions, especially those located on former orchard land, have streets named after apple varieties. The educational realm has the Biglerville High School ñCannersò and the Musselman High School ñApplemenò (Figure 6.9). Both high schools were built near Musselman apple processing facilities that were the major employment centers of Biglerville (PA) and Inwood (WV).



Figure 6.9 Musselman High School

Located in Inwood near a former Musselman applesauce factory, Musselman High Schoolôs sports teams are known as the ñApplemen;ò Berkeley Co. WV

Photograph by Joseph P. Guttmann

Most of the areaôs large festivals are also apple-themed. These include Winchesterôs (VA) Shenandoah Apple Blossom Festival, the Berkeley Springs (WV) Apple Butter Festival, Martinsburgôs (WV) Mountain State Apple Harvest Festival, and the Apple Blossom Festival and National Apple Harvest Festival held near Arendtsville (PA) (Figure 6.10). Pageants have long been associated with agricultural fairs and being named Miss Apple Blossom Festival, the Pennsylvania Apple Queen, or Queen Pomona (named for the Roman goddess of orchards and fruit) is a local honor. Although the West Virginia University experimental farm offers an open house during the Mountain State Apple Harvest Festival, actual grower participation at the festivals in Martinsburg (WV), Winchester (VA), and Berkeley Springs (WV) is very limited. These festivals are viewed more as civic celebrations to generate tourism than apple industry promotions (Kearns 2010; Miller 2010). Adams County (PA) growers are more involved in the Apple Blossom Festival run by the Adams County Fruit Growers Association (Horst 1999; Komancheck 2010).



Figure 6.10 Berkeley Springs Apple Butter Festival

Making apple butter in downtown Berkeley Springs; Morgan Co. WV

Photograph by Joseph P. Guttmann

The Shenandoah Apple Blossom Festival, the Apple Butter Festival, and the National Harvest Festival will each have daily attendance measured in the tens of thousands and pull festival goers in from the wider Washington-Baltimore metropolitan area. In addition to the festivals, visitors come to the Fruit District to shop at the on-the-farm retail stands, pick-their-own fruit, or passively consume the visual aspects of the ordered orchard landscapes as tourists. In Virginia, the Winchester-Frederick County Visitor Center has put together an audio driving tour called the ñApple Trailò that highlights the local apple industry and other historical sights. On the narrated tour, Virginia growers and industry insiders discuss the workings of an orchard and describe the current and former infrastructure that is seen along the tour (Figure 6.11).



Figure 6.11 The Apple Trail

The Apple Trail is a narrated driving tour on a compact disc that one can purchase for $8 at the Winchester-Frederick County Visitors Center. The route goes past the processing plants in Winchester and the orchards on Apple Pie Ridge; Frederick Co. VA

Photograph by Joseph P. Guttmann

Further north, Adams County (PA) offers the National Apple Museum in Biglerville, but considering the continuing importance of the fruit industry to the overall Adams County economy, there seems to be a disconnect between Gettysburg and the South Mountain Fruit Belt. Gettysburg is a national tourist attraction but travelers from the south or east (the routes from the Washington-Baltimore metropolitan area) would be unaware that there was a major orchard area near the battlefield. After passing the orchards near Thurmont (MD) on U.S. Route 15, there are no farm markets, signs, or other visual clues alluding to the South Mountain Fruit Belt (Figure 3.3; 3.10). While I was aware that Knouse Foods was headquartered near Gettysburg (PA), I was not aware of the concentration of orchards and the scope of the South Mountain Fruit Belt until after I started this dissertation. Recent efforts have been made so that growers can more effectively tap into the tourist market. One outgrowth of the Adams County Ag Innovations project has been the arrangement of a tour package offered to bus operators that has stops at several orchards and a winery (Baugher 2010). In addition, a group of fruit markets and wineries joined together in 2010 to create the Gettysburg Wine & Fruit Trail.

Regional Integration

One handicap that the Shenandoah-Cumberland Valley Fruit District faces is its political geography. Despite its position as the third largest eastern apple district by acreage, the functional unity of the Shenandoah-Cumberland Valley Fruit District is hampered by its being divided among four states (Figure 1.2; Table 5.12). This political division hinders cooperation at the regional level. For example, no overarching regional

association promotes and lobbies for all the growers in the Fruit District. There is a Pennsylvania Apple Marketing Program, Maryland Apple Promotion Board, West Virginia Horticultural Society, and a Virginia Apple Growers Association, but these groups cater to apple growers throughout their respective states, not just in the Fruit District.

Growers located in different states within the Shenandoah-Cumberland Valley Fruit District often have more in common with each other than with growers from other regions of their own state. For example, the interests of the large, processing-based growers of the Virginia Shenandoah Valley differ from the small, direct market and fresh wholesale marketers of southern and Piedmont Virginia. In 2003, Virginia growers voted to eliminate the Virginia State Apple Boardôs voluntary apple tax which funded fruit research, marketing, and the stateôs contribution to the U.S. Apple Association (Van Meter 2003). While the counties in the Shenandoah Valley account for 69.6 percent of the apple acreage in the state of Virginia, the southern Virginia growers who voted to repeal the tax carried the day (Van Meter 2003; USDA NASS 2005).

Unlike the Washington Apple Commission which has effectively given a brand name to apples produced in its state, the Shenandoah-Cumberland Valley Fruit District lacks an identity with the general public. The area that contains the Fruit District is sometimes referred to as the ñAppalachianò growing region or the ñMid-Atlanticò region, but both of these terms refer to areas of a grander geographic scale than the study area. In fact, use of the term Shenandoah-Cumberland District for this dissertation was borrowed from a 1921 book as no common, present-day term describes the geographic

region (Folger and Thomson 1921). The ambiguous geographic identity makes it difficult to promote and distinguish apples grown in the Fruit District based on place. Apples grown in the Shenandoah-Cumberland Valley Fruit District are often generically branded as ñlocally grown eastern fruitò or by the specific state of origin (Fermata Inc. 2009).

From the mid-1930s to the early 1960s the Appalachian Apple Service, a joint agency of the state horticultural societies of Pennsylvania, Maryland, West Virginia, and Virginia, promoted ñAppalachian Apples.ò Funded by a growersô tax in the participating states except West Virginia, Appalachian Apples was disbanded in 1962 (Miller 1993b). Today, the Pennsylvania Apple Marketing Program and Virginia Apple Growers Association promote their stateôs apples but on a smaller scale than the largest packinghouses from Washington and the state associations in New York and Michigan. One grower from Virginia said that his state seems to miss out on some of the federal and state monies allocated to the apple industry in the larger states (Glaize 2010). The apple industries in West Virginia and Maryland are too small to justify a permanent staff for the promotion of their statesô apples. Some experts think that a regional marketing plan would be beneficial to the area (Marini 2010).

Political boundaries, travel distance, and the lack of a regional apple association mean that the growers in one state may have little or no contact with the growers from another state in the Fruit District. In the mail survey, growers were asked if they had business or social relationships with growers in other states (Table 6.11). Even though Gettysburg (PA) is only a 1 ½ hour drive to Winchester (VA), I was surprised by the high

percentage of Pennsylvania growers who had little or no contact with the growers of West Virginia and Virginia. On the other hand, 45.5 percent of the growers in Virginia reported a business relationship with a Pennsylvania grower. The percentage differences may be because the Adams County (PA) Nursery is the largest supplier of commercial fruit trees in the Fruit District and a few Virginia growers are members of the Pennsylvania-based Knouse Foods growers cooperative. Diane Kearns, treasurer of the largest Virginia apple operation and the chair of the Virginia State Apple Board, noted that other than talking semi-regularly with the grower who owns the Adams County Nursery, her contact with other Pennsylvania growers is limited (Kearns 2010).

Attempts to forge more official ties among the four states have occurred in the area of fruit research. Including the federal Appalachian Fruit Research Station, five tree fruit research stations are located within a two-hour drive of each other in the Fruit District. Fifteen years ago, an attempt to regionalize certain research positions did not come to fruition. A memorandum of understanding was signed among the land-grant universities in Pennsylvania, Maryland, West Virginia, Virginia, and New Jersey. As stated by an official at Virginia Tech, ñitôs real easy to sign a piece of paper but when you have to send money across state lines it gets a little more difficult (Marini 2010). Separately, although West Virginia University (WVU) was down to two research positions at its Kearneysville (WV) research station, WVU rebuffed Virginia Techôs offer to consolidate the two stateôs research and extension efforts and serve both states out of the larger Winchester (VA) facility. WVU had no interest in closing its experimental farm (Marini 2010).

Table 6.11 Interactions Between Growers in the Different States of the Shenandoah-Cumberland Valley Fruit District

PENNSYLVANIA GROWERS	PA	MD	WV	VA
Social relationships	84.9%	35.6%	8.2%	13.7%
Business relationships	80.8%	42.5%	9.6%	16.4%
Little to no contact	9.6%	45.2%	90.4%	79.5%

MARYLAND GROWERS	PA	MD	WV	VA
Social relationships	61.5%	84.6%	46.2%	23.1%
Business relationships	69.2%	84.6%	23.1%	15.4%
Little to no contact	23.1%	15.4%	69.2%	69.2%

WEST VIRGINIA GROWERS	PA	MD	WV	VA
Social relationships	17.2%	20.7%	71.0%	44.8%
Business relationships	20.7%	13.8%	71.0%	48.3%
Little to no contact	65.5%	72.4%	12.9%	44.8%

VIRGINIA GROWERS	PA	MD	WV	VA
Social relationships	22.7%	9.1%	66.7%	90.5%
Business relationships	45.5%	18.2%	66.7%	90.5%
Little to no contact	54.5%	81.8%	28.6%	4.8%

Note: Percentages will not add up to 100 percent. Growers were allowed to select more than one statement.
Source: Authorõs Mid-Atlantic Survey

Even though attempts at closer formal relationships have floundered, informal cooperation occurs between the researchers from different states in the Fruit District. Researchers keep abreast of each otherôs work so there is very little research overlap (Marini 2010). Researchers are also frequent guest speakers at the other statesô extension events. In addition, West Virginia and Virginia extension offices will often host joint field schools where new pesticide protocols and research findings are disseminated to the growers (Biggs 2011). More West Virginia and Virginia growers are also attending the Mid-Atlantic Fruit and Vegetable Convention which is sponsored by Pennsylvania, Maryland, and New Jersey (Baugher 2010; Marini 2010).

Because Maryland has the smallest number of growers, Maryland growers will often work with growers from Pennsylvania and to a lesser extent, West Virginia growers (Table 6.11). Many Maryland growers will attend extension events at Penn Stateôs Biglersville fruit research center in Adams County (PA) and Penn State will occasionally hold a field day in the Smithsburg area (Washington County, MD) (Semler 2010). In addition, one of the experimental plots used for the Penn State-directed Specialty Crop Innovations project is located at a commercial orchard in Maryland (Source 5003 2010). One example of cooperation across state lines is the co-ownership of a new mechanical string thinner by a grower in Adams County (PA) and a grower in Washington County (MD). Because the peach season begins earlier in Washington County (MD), the thinner is used there first before being sent north to Adams County (PA) (Lehnert 2011a).

Labor

Many types of jobs need to be done to run a successful orchard business, such as pruning, spraying, mowing, picking, supervising labor, managing harvest logistics, maintaining equipment, balancing the accounting books, and keeping up-to-date with regulatory paperwork (Marini 2010; Source 1103 2010). The grower and his or her immediate family will usually handle many of these tasks but, depending on the size of the operation, will often need to hire outside labor. This is especially true for some of the more arduous tasks such as picking apples. The largest numbers of seasonal workers are needed for harvest work but smaller numbers are also needed for pruning and hand thinning (Miller 2010; Orrs 2010). The difficulty in attracting local workers to low-paying, temporary jobs that are physically demanding has led many growers to rely on migratory or off-shore laborers for their seasonal harvest needs. Growers desire workers who are fast, handle the fruit with care, and will stay the entire season at a wage scale that the growers can afford to pay and still stay in business (Griffith 1986; Blank 1998; Sokolowski 2002a; Berg 2003; Evans 2009; Glaize 2010b). Apple growers selling to packinghouses and processors are ñprice takersò in the marketplace. This means that the operationôs profitability and long-term survival is dependent on containing costs, with labor accounting for the highest percentage of variable costs (Belrose Inc. 2010c).

For years, the availability and reliability of labor for the harvest season has been one of the main concerns of growers (Kilmer 1993; Miller 1993b; Heppel *et al.* 1997; Blank 1998; Lehnert 2007c). In a 2007 article, some of the nationôs largest apple and stone-fruit growers were interviewed. Six out of the seven growers specifically

mentioned that labor was the single most important issue facing the fruit industry (*American/Western Fruit Grower* 2007). Because all but the harvest costs have already been invested in the crop, growers worry whether they will have enough labor to pick the apples at their proper maturity. A shortage of labor can lead to overripe fruit or fruit that drops to the ground, lowering the potential return on that yearôs crop (Glaize 2010b). One grower summed up his reliance on migrant labor by saying, ñif these guys donôt show up one year, Iôm sunkò (Rose and Hiller 2007, 107).

Due to the amount of press that the labor issue has received, the results of my survey were surprising (Table 6.12). Only 22.6 percent of the growers in the Fruit District reported having difficulties finding enough labor for their operations. The percentages ranged from a low of 16.9 percent for Adams County (PA) to a high of 38.1 percent for Virginia. The geographic disparity is even greater for those growers with over two hundred acres of apples. Just 13.3 percent of large growers based in Pennsylvania reported difficulties in obtaining labor while one-half of the growers with over two hundred acres in Virginia and West Virginia had trouble finding labor for their orchard. Stephen Miller, a grower and a USDA fruit tree research horticulturist, also expressed some surprise at the low percentage of growers expressing difficulties finding labor. He thinks that maybe since labor has always been a problem, it is just not the burning issue at the moment. He adds that labor is still a topic that is always discussed at the larger annual fruit grower meetings and predicts that labor will continue to be a concern in the foreseeable future (Miller 2010).

Table 6.12 Grower Statements on the Labor Situation

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
I have trouble finding enough labor for my farm	22.6%	16.9%	22.2%	23.3%	38.1%
Most manual labor on my farm is done by migrant labor	69.3%	84.7%	69.2%	46.7%	61.9%
Local workers are an important source of labor	49.3%	44.1%	46.2%	56.7%	60.0%
The H-2A program is an important source of labor	21.3%	11.9%	23.1%	14.3%	54.5%

Note: Percentages will not add up to 100 percent. Growers were allowed to select more than one statement.
Source: Authorôs Mid-Atlantic Apple Survey

Besides family members, growers obtain labor from temporary guest workers, migrants, and from those living in the local area. Guest workers from Jamaica and Mexico are obtained through the H-2A visa program (Griffith 1986; Kilmer 1993; Sokolowski 2002a; Bump 2005; Ford 2008). The H-2A program brings off-shore labor (temporary guest workers) to areas with a documented shortage of labor for the duration of the harvest season (Griffith 1986). The question over what constitutes a true labor shortage has proven to be controversial. Labor rights activists contend that domestic labor would be sufficient if the wage scale was higher and that the importation of H-2A workers is being used to keep downward pressure on wages. The advocates are also critical of the lack of freedom for H-2A workers to change employers once the guest workers are in the United States (Griffith 1986; Schrecongost 1999; Hall 2002; Swain 2010). Growers using the H-2A program counter that simple worker availability in the

local domestic labor pool does not equal a willingness to work and that the local domestic laborers who are hired for harvest work either do not show up or tend not to stay for the entire season (Griffith 1986; Sokolowski 2002a; Ferry and Brock 2003; Glaize 2010b; Hollabaugh 2012). By going the route of the H-2A program and hiring other migratory agricultural laborers, growers contend that they get a reliable, experienced crew. In exchange, the guest workers help support their families by being able to earn more in the United States than they could for similar work in their home country (Griffith 1986; Rose and Hiller 2007; Harper 2010; Hollabaugh 2012).

The most important advantage is the H-2A program offers a guaranteed work force, thereby easing the growerôs anxiety over his or her labor situation (Sokolowski 2002a). Because H-2A workers are only permitted to work for one employer, they are essentially a captive workforce. This eliminates the worker turnover that is common to strenuous, low-paying jobs and prevents workers from leaving mid-season for other opportunities (Griffith 1986; Heppel *et al*. 1997; Schrecongost 1999; Hall 2002; Stern 2008; Swain 2010). Another advantage of the H-2A program is that it allows growers to hire workers through a legal framework, unlike many migratory laborers who are illegal aliens with falsified documents (Evans 2009; Glaize 2010b).

A disadvantage of the H-2A system is that it is more expensive than hiring migratory workers. Growers pay application fees, transportation costs, housing, and provide either food or cooking facilities (Schrecongost 1999; Sokolowski 2002a; Stern 2008). Given that the central premise of the program is a shortage of available labor, the growers must first advertise for domestic workers in the newspaper or through the

relevant state Department of Labor in order to demonstrate a legitimate need (Griffith 1986; Evans 2009; Glaize 2010b). The question of whether there is a legitimate need for guest workers has led to costly legal battles with labor advocacy groups (Griffith 1986; Schrecongost 1999). For example, from the late 1970s to the early 1990s, a series of lawsuits were filed by advocacy groups such as Legal Services against the Tri-County Labor Camp and West Virginia growers using the H-2A program. Tri-County Labor Camp was a corporation formed by West Virginia growers to hire and house domestic migrant and temporary guest workers at a facility outside Martinsburg, West Virginia (Kilmer 1993; Heppel *et al.* 1997; Miller 2010). Court costs, monetary judgments, and frustration pushed a few growers out of the business and the Tri-County Labor Camp was eventually shut down (Schrecongost 1999; Miller 2010). By 1992, no H-2A workers were used in West Virginia (Heppel *et al.* 1997). Labor advocacy groups have also sued growers from Virginia and Pennsylvania who have used the H-2A program (Stern 2008; Source 5003 2010; Source 5006 2010; Hollabaugh 2012).

Finally, the paperwork to obtain H-2A guest workers is onerous. The forms are long, detailed, time-consuming, and growers often need to hire an agent for assistance with the process. Rules frequently change with the changing of presidential administrations and decisions by the Department of Labor are often delayed or inconsistent (Stern 2008; Evans 2009; Glaize 2010b; Idlebrook 2010; Hollabaugh 2012). For example, when the Frederick County (VA) Fruit Growers Association sent five identical applications to be processed by the Department of Labor, three of the five applications were accepted and two were rejected for two different reasons (Glaize

2010b; Source 5006 2010). Over the years, the Frederick County (VA) Growers Association, the Tri-County Labor Camp and other growers on the East Coast have had to use the judicial system and pressure from Congressional representatives to gain last minute certification for their workers just days before the start of the harvest (Griffith 1986; Heppel *et al*. 1997; Glaize 2010b). In comments on the survey, several growers were adamant in their refusal to use the H-2A program with some commenting that it was not worth all the extra paperwork (Source 1065 2010; Source 3224 2010).

Only 21.3 percent of the growers in the Shenandoah-Cumberland Valley Fruit District report that the H-2A program is an important source of labor for their operation (Table 6.12). Both West Virginia and Adams County had percentages less than 15 percent while 54.5 percent of growers in Virginia use or used the guest worker program. These percentages correspond with the percentages of growers that reported difficulty in finding labor. Virginiaôs percentage of growers using the H-2A program is also highest because it has the infrastructure that caters to the needs of the program. The Frederick County (VA) Growers Association provides housing and meals in a large camp and the Associationôs employees do the application paperwork for the certification process (Sokolowski 2002a; Stern 2008; Danoy 2010). On the other hand, given the fallout from the legal battles concerning the Tri-County Labor Camp, it is no surprise that very few West Virginia growers use the H-2A program. What is interesting is that of the 15 growers in the Virginias that use or used the program, only one had an apple orchard of less than 150 acres. The opposite was true in Pennsylvania and Maryland where there is only one grower with more than one hundred acres of apples using the program. Most of

the 12 growers who use H-2A labor in Maryland and Pennsylvania have medium-sized operations of between 25 and 60 acres.

While a minority of growers use H-2A guest workers, almost 70 percent of the growers reported that most of the manual labor on their farm is done by migrant labor (Table 6.12). Several growers did comment that the question only applied to harvesting while the rest of the manual orchard work was done by themselves or local workers (Source 1065 2010; Source 1091 2010; Source 3224 2010). The vast majority of migrants are Hispanic, primarily Mexican (Schrecongost 1999; Rose and Hiller 2007; Zarrugh 2008). A small percentage of Haitians and Jamaicans also come to the area to pick fruit (Figure 6.12) (Heppel *et al*. 1997; Schrecongost 1999; Danoy 2010; Greenhalgh 2011). Domestic migrants are usually based in Florida and work a circular migration route up the East Coast moving from harvest to harvest. These workers may have picked winter vegetables, citrus fruits, strawberries, early peaches, tobacco, and blueberries all before reaching the Shenandoah-Cumberland Valley to pick apples. Mexican-based migrants may do a modified version of this same route but spend the winter in their hometowns in Mexico instead of Florida. Mexican-based migrants may also just shuttle between their homes in Mexico and the Shenandoah-Cumberland Valley Fruit District (Heppel *et al.* 1997; Rose and Hiller 2007; Zarrugh 2008; Harper 2010). Most migrants are single men or married men whose families stay at the home base in Florida or Mexico. Whether a migrantôs home base is Mexico or Florida, the vast majority are foreign-born (Heppel *et al*. 1997; Schrecongost 1999; Carrol *et al*. 2005)



Figure 6.12 A Jamaican Apple Harvester

This gentleman from Jamaica has either traveled up from Florida for the apple harvest or resides in the local area and picks apples part-time on the weekends. Notice the burlap bottom of his bucket which protects the apples from bruising; Berkeley Co. WV

Photograph by Joseph P. Guttmann

Many in the seasonal migrant labor force are in this country illegally. According to estimates from the National Agricultural Workers Survey, over one-half of the hired agricultural workforce is illegal (Carroll *et al.* 2005). Many think that the percentage of workers here illegally is closer to 75 percent for harvest laborers (Schrecongost 1999; Glaize 2010b). Growers are required to check documents but many workers present falsified documents that are not easily detectable. Growers often do not know a workerôs true legal status until after the season is over when notices are sent out from the Social

Security Administration stating that a given employeeôs name and number does not match (Heppel *et al*. 1997; Schrecongost 1999; Berg 2003; Glaize 2010b; Harper 2010; Idlebrook 2010; Hollabaugh 2012). In the end, growers are faced with the choice to hire migrants that may or may not be in the country legally or use the regulatory burdensome and often dysfunctional H-2A visa program (Glaize 2010b; Idlebrook 2010).

Many growers have a relationship with a crew leader. Crew leaders can be formal or informal labor contractors whose primary responsibility is labor recruitment and supervision of that labor force (Heppel *et al*. 1997; Zarrugh 2008). For example, instead of dealing individually with each new hire, a grower may put in a request to his crew leader that 50 pickers are needed for the harvest and the crew leader will get the people (Miller 2010). Crew leaders also usually arrange travel arrangements for their crew and for housing if it is not provided (Schrecongost 1999). Other migrants come to the area based on suggestions from relatives and friends (Heppel *et al*. 1997; Schrecongost 1999; Rose and Hiller 2007; Zarrugh 2008). Some migrants end up working for the same grower year after year while others will come to the same county or area but may pick at a different orchard each year (Schrecongost 1997; Harper 2010). Several growers mentioned that they had done very little to actively recruit labor, noting that ñYou donôt find them, they find youò (Heppel *et al*. 1997).

In addition to migrant labor, almost one-half of the growers in the Fruit District reported that local workers are an important source of labor (Table 6.12). Local hired labor is a mix of whites, blacks, and Hispanics that includes both long-time area residents and former migrants who have settled in the area. Some local residents assist with

orchard management, do orchard maintenance, or work in harvest support roles such as driving trucks, operating forklifts, or supervising labor (Heppel *et al*. 1997). Others continue to work the traditional seasonal laborer jobs like picking, pruning, and hand thinning; they just no longer migrate. A number of former migrants are moving up into upper management positions and one in Hampshire County (WV) now owns his own orchard. Because it is easier to learn technical aspects in oneôs native language, the Mid-Atlantic Fruit Conference in Hershey (PA) now holds well-attended sessions in Spanish (Source 5003 2010).

Most pickers are paid by a piece rate since it incentivizes the laborers to work at a faster pace (Berg 2003). In his Congressional testimony, Phil Glaize noted that his harvesters earned an average of $93 for a nine-hour day with his best pickers earning more (Glaize 2010b). While apple pickers generally average higher than minimum wages, the pay scale is not high enough to preclude laborers from seeking other work opportunities. Other jobs that pull from the same labor pool include fruit, poultry, and other food processing, construction, landscaping, and behind-the-scenes work in restaurants (Bump 2005; Heppel *et al*. 1997). As more former migrants and other Hispanics settle in the region, informal networks increase the job opportunities for orchard laborers who would prefer other employment (Schrecongost 1999; Zarrugh 2008). The low percentage of growers reporting trouble finding enough labor may actually just be a by-product of the lull in the regional construction industry caused by the recent recession. When the economy picks up again, the labor market for orchard work will likely tighten (Glaize 2010a; Kearns 2010).

From the interviews, it was clear that growers in the Shenandoah-Cumberland Valley Fruit District use a variety of strategies to satisfy their labor needs. For example, Fruit Hill, one of the largest operations in Virginia, uses a mix of H-2A guest workers, domestic migrants, and local workers. The company employs approximately 20 year-round workers. That number swells to around 200 seasonal workers for the harvest (Kearns 2010). Diane Kearns, the companyôs treasurer, said that the company uses the H-2A system because they have used it for many years and she believes that they would not have enough labor without the infusion of guest workers. Despite the fact that the H-2A system is more expensive and the paperwork is cumbersome, Kearns feels the trade-off is worth it because the H-2A program mitigates the risk of not having enough workers (Sokolowski 2002a; Stern 2008; Kearns 2010).

George S. Orr & Sons, the largest operation in West Virginia, takes a slightly different approach. The family does not use H-2A workers but relies on local workers and migrants. Orrôs employs around 20 local Hispanic males to hand thin the peach crop. Their workforce increases to 40 for the peach harvest and 75 for the apple harvest (Orrs 2010). Many of the harvesters are Hispanic migrants who are brought in by a crew leader who has a long-term relationship with the Orrs (Miller 2010). Orrôs also employs around 20 full-time workers for orchard maintenance. These workers receive lower rents on houses owned by the Orrôs near the orchard in lieu of higher wages (Orrs 2010). At their packinghouses located at the orchard, Orrôs uses a seasonal workforce that appears to consist of a mixture of local whites and Hispanics.

Another operation that uses local and migrant labor in addition to family members is Kuhnôs, a medium-sized orchard in Adams County (PA). The Kuhn family uses former migrants who have settled in the area and a few men who travel up from Florida each year. For the past three or four years, the Kuhns have had very little turnover on their seasonal crew. The family tries to pay their workers as much as they can afford because there is ñnothing better than not having to retrain someone every single yearò (Kuhn 2010).

Other orchards, especially small-acreage operations, rely mostly on family members for their labor requirements. One West Virginia grower with about 4,000 trees, does all his own labor including harvesting. His wife assists him and so do his children when they are home (Source 3199 2010). There are two small, diversified organic farms in the Fruit District where volunteers assist with the labor needs. Steve and Ruth Martin of Hampshire County (WV) provide room and board for a yearly intern that they obtain through the World Wide Opportunities on Organic Farms network (Martin and Martin 2010).

As the orchard labor supply transitioned away from local workers, growers found it necessary to provide housing for the seasonal migrant labor (Berg 2003). Growers in West Virginia and Virginia responded to the housing need by constructing two large, centralized labor camps that could hold hundreds of workers (Figure 6.13). The labor camps hosted both H-2A guest workers and domestic migrants. Most migrant workers were single men but some families also stayed at the camps. The workers were bused each morning from the central location to the outlying orchards. Communal meals were

also provided to the workers (Heppel *et al*. 1997; Bump 2005; Stern 2008; Danoy 2010; Miller 2010; Greenhalgh 2011). In 1980, the Tri-County Labor Camp located outside of Martinsburg (WV) requested 578 off-shore workers while the Frederick County (VA) Growers Association labor camp was housing around 800 Jamaicans and 200 domestic migrants during the 1985 harvest season (Ebert and Lazazzera 1988; Heppel *et al*. 1997). While the Tri-County Labor Camp (WV) has been shut down and converted to a business park and storage space, the Frederick County (VA) Growers Associationôs labor camp in Winchester (VA) is still used. For the 2007 season, the camp in Winchester housed 277 H-2A workers from Jamaica, 26 H-2A workers from Mexico, and 147 domestic migrant workers (Ford 2008).

Growers in other parts of the Fruit District adopted a decentralized form of housing for migratory labor (Figure 6.13). Many growers built their own small ñlabor campsò on their property. Some camps are rather isolated at the edges of orchards while others are located closer to the barns and the orchardôs center of operation. Most camps consist of cinder block buildings or trailers. The camps are utilitarian and inconspicuous on the landscape (Rose and Hiller 2007; Zarrugh 2008). Before doing this study, I had seen some buses of migrants but I had never noticed the labor camps. While providing housing for domestic migrants is not required by law, free housing does help to attract workers to that particular orchard (Heppel *et al*. 1997; Berg 2003). Once the grower provides housing, he or she essentially becomes a landlord and is subject to making sure that facility stays up to code. Housing is one of the areas where growers have come into conflict with legal advocacy groups such as Legal Services and Friends of Farmworkers.

These groups and government agencies have been quick to sue and fine the growers over violations (Schrecongost 1999; Berg 2003). While living conditions in the camps have improved in the past 40 years, many growers have decided that providing housing is not worth the hassle. Workers at orchards that do not provide housing must find and rent their own housing in nearby towns (Heppel *et al*. 1997; Schrecongost 1999).



Figure 6.13 Migrant Housing Patterns

Top ï Former Tri-County Labor Camp. Like the Frederick County Growers Association Migrant Labor Camp in Winchester, VA, Tri-County was a centralized housing complex where migrants were bused to the orchards each day. Today the Tri-County Labor Camp has been converted to a business park and storage space; Berkeley Co. WV *Bottom Row* ï Decentralized migrant housing located at or near the orchards. Bottom left is in Adams County, PA and bottom right is in Berkeley County, WV

Photographs by Joseph P. Guttmann

Over the past 25 years, an increasing number of former migrants have settled permanently in the area. A small Jamaican and Haitian community began settling in Martinsburg (WV) in the 1980s (Figure 6.12) (Heppel *et al*. 1997). Hispanics began settling in numbers later. By 1990, for example, permanent resident Hispanics were still uncommon in the Shenandoah-Cumberland Valley Fruit District (Berg 2003; Bump 2005; Zarrugh 2008). Both the establishment of informal job networks and the increased costs and difficulties in crossing the international border encouraged the permanent settlement of former migrants and other Hispanics in the area. Former migrants and their families that joined them were able to obtain year-round jobs in construction, poultry plants, and other manufacturing facilities (Heppel *et al*. 1997; Bump 2005; Rose and Hiller 2007; Zarrugh 2008). The employment office sign for Knouse Foods is, for example, now written in both English and Spanish. Other former migrants remained in agriculture, working either full-time or seasonal jobs in the orchards (Heppel *et al*. 1997).

By 2010, the Hispanic population in the Shenandoah-Cumberland Valley Fruit District had grown from less than 1 percent in 1990 to almost 5 percent of the total population (U.S. Census Bureau 2007, 2011). While many factors have contributed to the growth in the regional Hispanic population, the settling of migrant farm workers has changed the ethnic make-up in some areas (Bump 2005; Zarrugh 2008). For example, all the small towns located in the South Mountain Fruit Belt in Adams County (PA) now have significant Hispanic populations (Table 6.13) (Rose and Hiller 2007). While the former migrants have not been welcomed with open arms by the general population, there is a tolerance and wary acceptance of the newcomers. Communities in Adams County

(PA) and other places in the Fruit District have made efforts to accommodate migrant and former migrant workers through English as a Second Language (ESL) classes, health clinics that are geared to the seasonal migrant population, Spanish church services, and numerous charities catering to the needs of the Hispanic population (Schrecongost 1999; Bump 2005; Zarrugh 2008).

Table 6.13 Growth of the Hispanic Population in the South Mountain Fruit Belt of Adams County, Pennsylvania, 1990–2010

	Total Population 2010	Percentage Hispanic 1990	Percentage Hispanic 2010
Arendtsville	952	1.6%	16.4%
Bendersville	641	3.0%	21.1%
Biglerville	1,200	5.0%	19.1%
New Oxford	1,783	1.8%	15.4%
York Springs	833	4.0%	46.1%
Gettysburg	7,620	3.3%	10.9%
Adams County	**101,407**	**1.6%**	**6.0%**

Source: U.S. Census Bureau

.

Key Findings for Chapter Six

- Since 1980, population growth rate in the Shenandoah-Cumberland Valley Fruit District has been higher than the overall U.S. population growth rate.
- Population growth in the Fruit District is related to internal job growth and a greater integration with the Washington-Baltimore metropolitan area. With the spatial enlargement of the commuter shed, more residents from the Fruit District commute to the job centers of suburban Washington, D.C.
- High housing costs and restrictive housing policies in the affluent counties of suburban Washington, D.C. has pushed development into developer-friendly areas of the Shenandoah-Cumberland Valley Fruit District. The county in the Fruit District with the largest gain in population in the past ten years, Berkeley County (WV), does not impose zoning or new housing impact fees.
- A majority of Fruit District growers report high development pressures in their area over the past 15 years. The percentage of growers who report high development pressures was highest in the West Virginia sub-region. Encroachment of new development on prime orchard land is most visible in the northern Shenandoah Valley counties of Berkeley (WV), Jefferson (WV), Clarke (VA), and Frederick (VA). Over one-half of the growers in these northern Shenandoah Valley counties do not anticipate that their land would remain in agriculture if their farm were to be sold.
- The majority of growers in Adams County (PA) reported medium development pressures. The county did not experience the mid-2000s housing boom to the

same degree as the other major apple-producing counties in the Fruit District. Over the past 10 years, the percentage decrease in apple acreage was lowest for Adams County compared to the other sub-regions.

- Severe apple acreage declines in the Appalachian Ridge and Valley province prior to 1992 can be attributed to the loss of the mountain orchardsôcomparative advantage in producing highly colored apples.
- The influence of the apple industry on the formation of regional identity is expressed through the use of public apple iconography in various areas of the Fruit District. The largest festivals in the area celebrate the apple.
- Political divisions hamper cohesiveness within the Shenandoah-Cumberland Valley Fruit District. Many of the growers in Pennsylvania do not interact with the growers in Virginia. The states are reluctant to fund formal cross-state endeavors but informal networks of cooperation exist.
- Less than one-quarter of the survey respondents reported having difficulty finding enough labor for their operation. Over one-half of Virginia growers use H-2A guest workers but the visa program was infrequently used in other parts of the Fruit District. Criticisms of the program include the onerous paperwork and a history of legal challenges from labor advocacy groups. Most growers rely on a combination of migrant and local workers to meet their seasonal labor needs.

CHAPTER 7: FARM-LEVEL FACTORS IN THE DECISION TO CONTINUE OR EXIT APPLE PRODUCTION

Chapter Seven evaluates factors at the micro-scale or farm-level that affect a growerôs decision to continue or exit apple production. The chapter begins with sections describing the general demographic profiles of the apple growers and their farms in the Shenandoah-Cumberland Valley Fruit District. Demographic topics discussed are the growersô age, education, employment status, percentage of income earned through farming, and whether or not the growers self-identify as apple growers. Farm topics include the amount of apple acreage per farm and the diversification of the farmsô product base. The growing of peaches as a complementary product is highlighted. The following three sections discuss grower participation in the fresh wholesale, processing, and direct-to-consumer markets. Examples of on-the-farm retail outlets in the West Virginia sub-region are highlighted to show the variety of approaches taken within one marketing strategy. This is followed by a discussion on the factors that influence a grower to reinvest in his or her farm. These factors include the growersô optimism for the future of apple-growing in their area, the importance of maintaining a farm lifestyle, and their expectations for a child or other close associate to eventually take over the farm. Past farm reinvestment strategies and the future plans of growers are assessed. The impact of the innovative Young Growers Alliance is highlighted. The chapter concludes with the presentation of the growersô own ratings of the importance of certain factors that may play a role in the decision to stop growing apples.

Grower Demographic Profiles

Several questions on the survey were written to gain some general background information about the growers in the Shenandoah-Cumberland Valley Fruit District. This information included the growersô age, educational attainment, employment status, and whether or not he or she currently produces apples. In 2009, 82 percent of the survey respondents had produced apples (Table 7.1). The 18 percent that had not produced apples had been out of the business for a median of six years. That the survey skewed towards current growers was expected considering the difficulties encountered in obtaining former grower addresses. More surprising was the geographical distribution of former growers. Only four growers from Adams County (PA) had not produced apples in 2009. The 93.7 percent that were classified as current growers from Adams County contrasts with the 69.2 percent from Virginia and 67.6 percent from West Virginia (Table 7.1). On the surface, it appears that more growers left the business in the Virginias compared to Adams County. But given that Adams County accounted for 42 percent of all responses, it is also possible that the disparity between former and current grower response rate is a result of a coverage or non-response error. Former growers in Adams County may have chosen not to respond at the same rate as the other sub-regions or I was unable to obtain very many former grower addresses in Adams County. The lack of responses from the former growers of Adams County needs to be taken into consideration when comparisons of former and current growers are made later in this study.

Table 7.1 Percentage of Respondents who Produced Apples in 2009, by Sub-Region

Sub-Region	Percentage
Adams County	93.7
Cumberland Valley	85.2
West Virginia	67.6
Virginia	69.2
Overall	**82.0%**

Source: Authorôs Mid-Atlantic Apple Survey

The average age of the current apple growers in the Shenandoah-Cumberland Valley is 56.9 years old, very close to the national average for all farmers at 57.1 years old (USDA NASS 2009b) (Table 7.2). The average ages of the current growers in West Virginia, Virginia, and the Cumberland Valley range between 58.4 and 59.4 years old. Adams County has a younger age profile. That countyôs average age for current growers is 54.4 years and almost 9 percent are under the age of 40. Neither West Virginia nor Virginia had any growers under the age of 40 and the Cumberland Valley has only 4.5 percent. About 32 percent of current growers in Adams County are under the age of 50 while the next closest sub-region, West Virginia, has 16.7 percent under that age. Only 5.4 percent of the current growers from Adams County continue to farm after the age of 70 while the other three sub-regions range from 13.6 percent to 18.2 percent. Current grower ages range from 29 years old to 84 years old with the median age of the entire Fruit District being 56.5. The average age of the former growers who responded to the survey is 63.3 years old.

Table 7.2 Percentage of Current Growers in the Following Age Groups

Age Group	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Under 40	5.1%	8.9%	4.5%	0%	0%
40 - 49	16.9%	23.2%	4.5%	13.6%	16.7%
50 - 59	38.1%	33.9%	54.5%	36.4%	33.3%
60 - 69	28.8%	28.6%	18.2%	36.4%	33.3%
70 years and older	11.0%	5.4%	18.2%	13.6%	16.7%

Source: Authorôs Mid-Atlantic Apple Survey

When it comes to educational attainment, apple growers run the gamut from high school dropouts to those with graduate degrees. Running an apple operation requires the grower to wear many hats. Growers need to know horticulture, entomology, weed science, and plant pathology. They also need to exhibit sound business management, maintain good labor relations, and keep up with all the regulatory paperwork. Many growers operate and repair their own equipment (Marini 2010, Source 1103 2010). Because many of the necessary skill sets to running an apple orchard are forms of practical knowledge that are learned on the job, many growers forgo attending college. For example, one progressive grower says that he received his schooling from the ñHarry Black (his father) School of Practical Learningò (Colby 2011). Other growers have chosen to continue their schooling beyond high school. Over 40 percent of growers reported that they have between 13 and 16 years of formal schooling (Table 7.3). One grower said that one of the best things that happened to him was that his parents sent him to college. He said that one important outcome of his education is that he can sit in a meeting with various experts in the field and relate to what that person is explaining

(Source 1103 2010). Another 17.4 percent attended school for 17 years or longer (Table 7.3). A few growers are just part-time farmers and attended graduate school as a requirement for their primary occupations as lawyers or research specialists, but most are full-time farmers.

Not all growers attended college with the intention of becoming fruit growers. A common theme in the interviews was of people going off to college and even working initially in another industry before returning to work in the family business (*Fruit Growers News* 2007; Glaize 2010; Kearns 2010; Kuhn 2010; Rice 2010). For example, the owner of the largest operation in the area earned degrees in chemical engineering from MIT while his daughter and co-operator earned physics degrees from Wake Forest University and Boston College (Nichols 2007). Another grower and packer worked in the banking industry before returning to the farm (Glaize 2010). Many of the leaders of the largest packing and processing companies are also well-educated. For example, the former CEO of National Fruit, the current CEO of Knouse Foods, and three of the Rice brothers of Rice Fruit all attended Ivy League schools (Lehnert 2012b).

Table 7.3 Grower's Educational Attainment

Years of Schooling	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Under 12 years	4.3%	4.9%	3.8%	6.7%	0%
12 years	37.7%	36.1%	61.5%	30.0%	23.8%
13 - 16 years	40.6%	41.0%	30.8%	40.0%	52.4%
17 years or more	17.4%	18.0%	3.8%	23.3%	23.8%

Source: Authorôs Mid-Atlantic Apple Survey

Growers in the Cumberland Valley tend to have less formal education than the other sub-regions. Only one-third of the Cumberland Valley growers went to school beyond high school compared to 76.2 percent of the growers from Virginia (Table 7.3). The educational attainment statistics of both Adams County and West Virginia were close to the overall Fruit District norm. Growers who have 200 acres of apples or more also have a distinct educational advantage. Almost 83 percent of growers with large-scale apple operations had formal schooling beyond high school compared to 52.4 percent of growers with less than 200 acres of apples. Whether the growers attended college or not, one specialist who has worked extensively in the field noted that tree fruit growers are pretty sharp. They need mental acuity because it is a tough business and growers have to be multidimensional in their knowledge base. The growers who made too many mistakes in the past are gone (Marini 2010).

The overwhelming majority of current growers consider themselves to be full-time growers (Table 7.4). Only 9.2 percent were employed part-time off the farm, 6.7 percent were employed full-time off the farm, and 5.9 percent were reported being retired but were still running their orchard. The numbers were close to the norm in all sub-regions with the exception of Virginia. In Virginia, 22.2 percent of current growers reported having part-time employment off the farm and 16.7 percent were retired. Part-timers lowered Virginiaôs percentage of full-time growers to 55.6 percent.

Table 7.4 Employment Situation of Current Growers

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Full-time farmer	78.2%	79.3%	87.0%	85.0%	55.6%
Employed or self-employed full-time, off the farm	6.7%	10.3%	0%	5.0%	5.6%
Employed or self-employed part-time, off the farm	9.2%	6.9%	4.3%	10.0%	22.2%
Retired	5.9%	3.4%	8.7%	0%	16.7%

Source: Authorôs Mid-Atlantic Apple Survey

Over 80 percent of current growers self-identify as being primarily fruit growers. Of the growers who did not self-identify themselves primarily as fruit growers, eight said that their primary focus was another form of agriculture such as growing vegetables, Christmas trees, grains and hay, beef cattle, or dairy. Other growers identify more with their occupations outside of agriculture. These growers are involved in a diverse range of occupations including carpentry, consulting, law, the ministry, and working as a mail carrier. Many growers have diversified income streams since only 56.3 percent earn more than 75 percent of their annual taxable income from farming (Table 7.5). This percentage is highest in the Cumberland Valley and lowest in Virginia. In addition to growers holding other jobs, household income can be earned through investments, the leasing of land, Social Security or other pension benefits, and off-farm spousal employment (Hoppe and Banker 2010). The percentage of a growerôs household earnings from farming factors into how dependent that grower is on the annual returns on

the crop for the familyôs economic well-being. While other factors such as the familyôs debt load play a role, those households with a more diversified income portfolio should be able to weather a few poor seasons more easily than a grower dependent on farming alone.

Not all growers produce apples purely to make ends meet as one-third reported that they consider maintaining their orchards as a hobby or retirement project. These percentages vary geographically with a high of 45 percent from West Virginia and a low of 16.7 percent from Virginia. Only 18.4 percent of those running a hobby or retirement operation reported acquiring their farmland within the past 20 years. For most growers, the farmland has been in his or her family for many years.

Table 7.5 Percentage of Current Growers who Earn at Least 75 Percent of their Annual Taxable Income from Farming

Sub-Region	Percentage
Adams County	60.0
Cumberland Valley	68.4
West Virginia	50.0
Virginia	38.9
Overall	**56.3%**

Source: Authorôs Mid-Atlantic Apple Survey

The Farms

The total apple acreage reported by those growers who responded to the survey amounts to 23,822.5 acres (Table 7.6). This total includes the acreage from former growers whose orchards may have been removed or sold or leased to current growers and thus double counted in the overall total. The total apple acreage for just current growers is 19,855.5 acres. The break down by sub-region of the respondentsô apple acreage once again exposes a possible coverage or non-response error. In the survey, the acreage for current growers is almost even for Adams County and Virginia while, in actuality, the difference between the two sub-regions is nearly 3,500 acres in favor of Adams County (Table 3.6) (USDA NASS 2009b). Two possible explanations can be offered for this discrepancy. The main reason is that several of the largest, well-known orchards in Adams County did not respond to the survey while the largest operations in Virginia did respond. Non-respondents to the survey include four orchards in Adams County that received the full amount available from the Apple Market Loss Assistance Program from 2001ï 2003 and six orchards that received at least two-thirds of the amount available. Any orchards that received the full $150,100 or almost full subsidy are large-acreage orchards (EWG 2010). In contrast, the Virginia sub-region had two non-respondents that received the full subsidy and one orchard that received at least two-thirds of the full subsidy. The other possible explanation for the equal acreage amounts for the two counties as reported by the respondents is that I am more confident that I had closer to a complete address list for the Virginia sub-region *vis-à-vis* the list for Adams County.

Table 7.6 Total Apple Acres Reported by Survey Respondents

Sub-Region	All Growers	Current Growers Only
Adams County	7,848.5	7,718.5
Cumberland Valley	2,114	2,044
West Virginia	3,248	2,386
Virginia	10,612	7,707
Overall	**23,822.5**	**19,855.5**

Source: Authorôs Mid-Atlantic Apple Survey

A sizable difference exists between the average and median apple acreages per farm (Table 7.7). Only in the Cumberland Valley is the difference within 30 acres while the difference balloons to 363 acres in Virginia. The breakdown by size category in Table 7.8 indicates that the majority of orchards in the Shenandoah-Cumberland Valley Fruit District are small-to-medium operations under 80 acres in size. This pulls the median acreage in the Fruit District down to 50 acres (Table 7.7). On average, the Cumberland Valley has the smallest orchards as it has the lowest average apple acreage per farm and only 20 percent of its orchards are over 80 acres in size (Table 7.8). In contrast, 50 percent of Virginiaôs orchards are over 100 acres and its average of 442.2 acres in apples per farm vastly exceeds all other sub-regions. Generally speaking, Virginia has fewer, but much larger, farms than those in Pennsylvania. Growers that have at least 200 acres in apples account for 87.4 percent of the apple acreage in Virginia and West Virginia and 68.7 percent in Pennsylvania. Including former growers, five out of the top six operations by size in the Fruit District are located in the Virginia sub-region with the other such farm being in the Cumberland Valley. Rounding out the top ten farms in apple acreage are two from Adams County and two from West Virginia.

Table 7.7 Average Size of Farm by Sub-Region

Sub-Region	Average Apple Acreage Per Farm	Median Apple Acreage Per Farm
Adams County	133.0	50
Cumberland Valley	84.6	56
West Virginia	108.3	60
Virginia	442.2	79
Overall	**173.9**	**50**

Source: Authorôs Mid-Atlantic Apple Survey

Table 7.8 Survey Question: Approximately how many total acres do you have planted in apples?

Apple Acreage	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
300 acres or more	14.5%	16.9%	4.0%	6.7%	29.2%
100ï 299 acres	21.0%	20.3%	16.0%	26.7%	20.8%
30ï 80 acres	36.2%	39.0%	44.0%	33.3%	25.0%
Under 30 acres	28.3%	23.7%	36.0%	33.3%	25.0%

Source: Authorôs Mid-Atlantic Apple Survey

That Virginia has the highest average apple acreage per farm is not surprising given the history of large-acreage orchards in both of the Virginia and West Virginia (Table 7.7). The holdings of Senator Harry F. Byrd Sr. in Virginia and West Virginia once made him the largest apple grower in the nation (Machemer and Miller 1993). In 1991, five operations in Virginia and West Virginia were listed among the nationôs top 25 apple and pear orchards by acreage (Table 7.9). By 2012, only two operations, Fruit Hill Orchards and Bowman Fruit Sales, were listed among the nationôs largest apple and pear orchards. It is the size of those two operations combined with the limited number of growers in the Shenandoah Valley that skews the Virginia sub-regionôs average apple acreage per farm compared to the rest of the Fruit District.

Table 7.9 Shenandoah-Cumberland Valley Fruit District Operations Listed Among the Nation's Top 25 Apple and Pear Orchards by Acreage

1991

National Ranking	Acreage	Orchard	Counties
7	2,500	Fruit Hill Orchards	Frederick VA; Shenandoah VA; Berkeley WV; Jefferson WV
11	1,884	National Fruit Product Company	Frederick VA; Rockingham VA Berkeley WV
15	1,635	Orchard Management/Senseny South (Byrd family)	Clarke VA Jefferson WV
16	1,600	Mt. Levels Orchards	Hampshire WV
17	1,409	Fred L. Glaize	Frederick VA; Shenandoah VA

1996

National Ranking	Acreage	Orchard	Counties
6	3,148	Fruit Hill Orchards	Frederick VA; Shenandoah VA Berkeley WV; Jefferson WV
8	3,100	Bowman Apple Sales	Shenandoah VA Rockingham VA
12	2,015	National Fruit Product Company	Frederick VA; Rockingham VA Berkeley WV

2012

National Ranking	Acreage	Orchard	Counties
9	3,472	Fruit Hill Orchards	Frederick VA; Shenandoah VA Berkeley WV; Jefferson WV
13	2,500	Bowman Fruit Sales	Shenandoah VA Rockingham VA

Source: *American/Western Fruit Grower* 1991, 1996, and 2012

One business strategy that is pursued by most growers is the diversification of their income stream by growing other commodities. In the Shenandoah-Cumberland Valley Fruit District, 63.4 percent of growers produce apples and another fruit (Table 7.10). Apples are still the dominant crop as all but 12 percent of growers have more acres in apples than other fruit. Geographically, the percentages of growers who produce apples and other fruit range from a high of 73.3 percent in Adams County to a low of 33.3 percent in Virginia. In the Fruit District, 43 percent of apple growers also grow a non-fruit crop such as corn or vegetables. In some cases, apples are not the farmersô primary crop. As noted in the demographic section, some apple growers primarily self-identify as being beef cattle, grain, vegetable, Christmas tree, or dairy farmers and apple-growing is a supplementary activity. The Cumberland Valley leads the pack with 69.2 percent of its growers having non-fruit crops while no other sub-region had more than 41 percent. The top four farms with the most non-fruit acreage were all in the Cumberland Valley sub-region. I did not ask about whether growers also maintained livestock, but it is not a common practice.

Table 7.10 Crop Diversification Among Apple Growers in the Fruit District

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Percentage that grow apples and another fruit	63.4%	73.3%	73.1%	59.4%	33.3%
Percentage of apple growers that grow at least 50 acres of another fruit	18.3%	25.0%	7.7%	18.8%	12.5%
Percentage of apple growers that also produce non-fruit crops	43.0%	36.7%	69.2%	40.6%	33.3%

Source: Authorôs Mid-Atlantic Apple Survey

Growers with over 200 acres in apples are more diversified in Pennsylvania than in the Virginias. Over 86 percent of large Pennsylvania growers also produce some other fruit with 73.3 percent having over 50 acres in other fruit. In the Virginias, 56.3 percent of large growers have diversified with some other fruit, but only one-third of the large growers have at least 50 acres in other fruit. Most large growers in the Fruit District specialize in fruit as only 22.6 percent grow non-fruit crops. On the other hand, 46.2 percent of growers with less than 200 acres in apples also produce non-fruit crops.

In the Shenandoah-Cumberland Valley Fruit District, peaches are the most common alternate fruit grown by apple growers (Figure 7.1). Peaches are a good complementary product as growing stone-fruit is not radically different from growing apples, yet the two fruits have different growing schedules. Only late-season peaches and early season apples have overlapping harvests. Peaches also earn more money per pound and earn a higher return than apples. For example, from 2007 to 2009, peach prices in Pennsylvania averaged 49.4 cents per pound and apple prices averaged 15.4 cents per

pound (Harper 2010; USDA NASS 2010c). According to Jeff Semler, an extension agent for Washington County (MD), peaches are a ñcash cowò for the growers and he made the comment that ñapples pay the bills, but peaches make (the growers) moneyò (Semler 2010). Several of the growers say this is true especially for the peaches that are directly marketed (Kuhn 2010). One Pennsylvania grower says that peaches are king at the farmersô markets that he attends (Wenk 2010). Peaches are in high demand because growers can pick them riper than those sent through a packinghouse and sold at a supermarket (Marini 2010). In addition to the better eating qualities, the fact that peaches do not store well encourages frequent return shopping trips. Apples on the other hand, can be bought and stored for several months at home if needed (Wenk 2010).



Figure 7.1 Diversification of Fruit Crops

Apple trees growing on the left and peach trees on the right; Adams Co. PA

Photograph by Joseph P. Guttmann

Most peaches in the Shenandoah-Cumberland Valley Fruit District are sold on the fresh wholesale market (Marini 2010; Miller 2010). Some wholesale peaches grown in Franklin and Adams County are marketed as ñChambersburgò peaches in the greater Pittsburgh area. This is the only example of a specific geographic place being used in the marketing of fruit in the Shenandoah-Cumberland Valley Fruit District and even this place-based marketing is localized. ñChambersburgò peaches do not have cachet outside of western Pennsylvania (Freshplaza 2007; Sollenberger and Kammerer 2007; Fermata Inc. 2009). A smaller share of the Fruit Districtôs peaches is purchased by processors such as Knouse for peach pie filling or by out-of-state baby food manufacturers (Bennett 2004; Guise 2010). Canned peaches are some of the main products of the Shawnee Springs Cannery and Kimes Cider Mill, but the two companies have limited distribution (Kimes Cider Mill 2011; SSCC 2011). Today, the majority of the canned peaches in supermarkets are grown in California or Asia (USDA ERS 2010a).

While peaches have a higher potential payoff, peaches are less forgiving of extreme weather conditions, making them a riskier undertaking than apples (Kuhn 2010). With peaches, the potential always exists of losing the entire crop, usually due to early freezes or hail. Apples have lower but steadier returns. Damaged apples can always be shifted from the fresh market to the lower-value processing sector. As long as apples are paying the bills, a grower can lose a peach crop and the apples will keep the operation afloat until the next season (Semler 2010). Weather uncertainties induce growers to mitigate risk by planting apples and peaches or just apples. Growers with peaches but no apples are rare in the Shenandoah-Cumberland Valley Fruit District.

Like apples, peach acreage has significantly declined in the Shenandoah-Cumberland Valley Fruit District. The Fruit District has lost 67.4 percent of its peach acreage which follows a national trend in declining acreage (Table 7.11). A small percentage of this decline was due to an outbreak of plum pox, a disease that affects stone-fruit. As a consequence of the outbreak, portions of Adams County (PA) were under quarantine where over 1,200 acres of trees were removed and no new plantings could take place. The restrictions have since been eased with the eradication of the disease (*Fruit Growers News* 2008; Harper 2010; Lehnert 2012a). Despite the outbreak, Adams County currently has almost one-half of the Fruit Districtôs peach acreage (Table 7.11).

Table 7.11 Peach Acreage by County

County	1982	1987	1992	1997	2002	2007	Acres Change 1982–2007
Adams PA	3248	3052	2833	2253	1303	1821	ï 1427
Franklin PA	2184	1523	944	574	639	516	ï 1668
Cumberland PA	156	92	65	106	57	46	ï 110
Washington MD	1886	893	437	262	219	286	ï 1600
Berkeley WV	2071	2273	1460	1080	739	697	ï 1374
Jefferson WV	526	365	468	117	258	101	ï 425
Hampshire WV	865	733	894	277	233	233	ï 632
Frederick VA	825	777	615	607	414	243	ï 582
Shenandoah VA	91	75	71	23	15	11	ï 80
Rockingham VA	301	284	200	184	37	*8*	ï 293
Total	**12,153**	**10,067**	**7,987**	**5,483**	**3,914**	**3,962**	**–8,191**

Source: USDA, *Census of Agriculture*

While Virginia has 30.5 percent of the Fruit Districtôs apple acreage, it only has 6.6 percent of the Fruit Districtôs peach acreage (Table 7.11). This reflects the fact that only one-third of the growers in the Virginia sub-region grow another fruit and that the three largest growers, who have almost 6,000 acres among them, have only around 15 acres in peaches combined (Table 7.10). In fact, more peaches are grown in the central Virginia Piedmont than in the Shenandoah Valley, whereas the Valley has a four-to-one advantage in apple acreage (USDA NASS 2005). At one time, National Fruit operated a peach cannery in Timberville (Rockingham County, VA) but today, peaches are almost gone from the southern part of the Virginia sub-region (Marini 2010; NFPC 2010).

Several possible explanations can be offered as to why growers in the Virginia sub-region do not have more acres in peaches despite the potential higher returns. First, there is a glut of peaches on the wholesale market from South Carolina, New Jersey, and California when Virginiaôs peaches are ready for harvest and the prices are at a seasonal low. This discourages new entrants into the wholesale market. Tree care for peaches is also more management- and labor-intensive which requires a different mindset and business strategy than producing processing apples (Marini 2010). Climate may also be a factor as the northern Shenandoah Valley is a little bit drier than the rest of the region. Peaches do best with irrigation and the water may just not be available when needed (Marini 2010; Van Meter 2010). Two of the largest peach growers in Frederick County (VA) are actually not located in the Shenandoah Valley but have orchards in the Appalachian Ridge and Valley section of the county. One large apple grower said that the decision to not grow peaches is partly because his family has never been in the peach

business and also because of memories of the local peach crop being frozen out three out of the first five years he was in the business (Glaize 2010a). Finally, unlike Adams County (PA), no packing and processing options for peaches exist in the Shenandoah Valley. The small packer, Timber Ridge, and the Shawnee Springs Cannery essentially pack and process their own peaches. The two largest packinghouses in the Virginia sub-region do not handle wholesale peaches (Glaize 2010a). Likewise, National Fruit and Bowman Apple do not produce processed peach products. If Virginia growers want to grow peaches beyond the scale needed to supply direct market sales, the growers would need to pack them themselves or sell to out-of-state packers and processors.

Fresh Market Wholesale

Most people cannot purchase apples directly from a grower so an efficient distribution system has developed to bring the apples from the orchard to the grocery stores and restaurants patronized by consumers. After the apples are harvested, the apples are immediately taken to a packinghouse. The packerôs job is to make the apples presentable for sale and capable of withstanding handling in the transportation process with minimal damage to the fruit. Like packinghouses across the country, the packers of the Shenandoah-Cumberland Valley Fruit District ship to both grocery store distribution centers and wholesalers typically located at city terminal markets. For example, Rice Fruit Company of Adams County (PA) ships fruit to the Mid-Atlantic distribution centers of two of its largest customers, Wal-Mart and Costco, as well as to the distribution centers of national and regional supermarkets throughout the eastern United States. Rice also sends a daily truckload of apples to a customer at the New York City terminal

market and frequent truckloads to a wholesaler in Boston (Warner 2006; Rice 2010). From the terminal market, delivery trucks will then take the apples and other produce to restaurants, green grocers, supermarkets, other wholesalers, and institutions that serve food throughout the city and region (Guenthner 1993; CIPM 2007).

In the Shenandoah-Cumberland Valley Fruit District, almost 60 percent of the growers sell apples on the fresh wholesale market (Table 7.12). The most common fresh wholesale outlet is selling through a local packinghouse but some growers sell directly to a grocery store or use other miscellaneous wholesale outlets. No orchard operation sells over 90 percent of its crop on the fresh wholesale market. Even a grower who focuses all of his or her production efforts on the fresh market will still have at least 20ï 25 percent of the apple crop that does not attain the aesthetic or size standards for the fresh market. The apples that do not qualify for the fresh market are sold to apple processors (OôRourke 1994; Schotzko 2004; Rice 2010). In fact, only 30 percent of the growers in the Fruit District sell more than 30 percent of their crop on the fresh wholesale market (Table 7.12). In addition to the fresh market culls, the low percentage of growers selling more than 30 percent of their crop on the wholesale market is because many growers of fresh wholesale apples also dedicate a sizable portion of their acreage specifically for the processing market (Table 7.13).

Table 7.12 Survey Question: What percentage of your apple crop is sold on the fresh wholesale market or to a grocery store?

Percentage of Crop	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
90ï 100%	0%	0%	0%	0%	0%
60ï 89%	12.5%	18.0%	8.3%	10.3%	4.5%
30ï 59%	17.6%	19.7%	20.8%	13.8%	13.6%
Under 30%	29.4%	32.8%	41.7%	17.2%	22.7%
Do not utilize these outlets	40.4%	29.5%	29.2%	58.6%	59.1%

Source: Authorôs Mid-Atlantic Apple Survey

Table 7.13 Percentage of Growers Who Produce Specifically for the Processing Market

Sub-Region	Percentage
Adams County	83.6%
Cumberland Valley	64.0%
West Virginia	60.6%
Virginia	81.8%
Overall	**74.5%**

Source: Authorôs Mid-Atlantic Apple Survey

A distinct geographic division exists between the northern and southern sections of the Shenandoah-Cumberland Valley Fruit District in terms of the percentage of growers selling apples on the fresh wholesale market or directly to grocery stores. In the Adams County and Cumberland Valley sub-regions, 70 percent of growers utilize fresh wholesale markets while that percentage drops to 40 percent for the Virginias (Table 7.12). The disparity can partially be explained by the size of Adams Countyôs (PA) Rice Fruit Company and the fact that the Rice packinghouse accepts fruit from about 50 other growers. The Rice Fruit Company is the largest apple packinghouse in the eastern United States (Rice 2010; Lehnert 2012c). Bear Mountain Orchards and Bream Orchards of Adams County (PA) also accept fruit from other local orchard operations while most of the packers in the Virginias only accept a limited percentage of outside fruit (Sollenberger and Kammerer 2007; Glaize 2010; Orrôs Farm Market 2010). In addition, Hess Brothers, a packinghouse located in eastern Pennsylvania that is comparable in size to Rice Fruit, has long sourced some of their apples from growers in the Fruit District (Williams 2012).

In the next five years, many growers in the Shenandoah-Cumberland Valley Fruit District are expecting to continue their transition away from processing apples to the higher-value fresh wholesale and direct markets (Table 7.14). This transition is occurring most dramatically in Adams County. Almost 65 percent of Adams County growers are expecting to increase their percentage of apples sold on the fresh wholesale market compared to an average of 33 percent in the other three sub-regions (Table 7.15). Growers wanting to tap into the demand for locally grown produce, a desire to increase

profits, and the willingness of the Pennsylvania packinghouses to accept other growersô fruit are fueling the transition to the wholesale market in Adams County (Torres 2010). The president of Rice Fruit Company notes that the packinghouseôs growers have planted new trees that will generate another 500,000 bushels of apples a year (Lehnert 2012a).

Table 7.14 Survey Question: In the next five years, do you expect the percentage of your apple crop that you sell to the following markets to...

Markets	Increase	Stay about the same	Decrease
Fresh market wholesale	48.5%	22.9%	3.4%
Retail on farm, farmers market, or other direct marketing outlet	42.4%	33.9%	1.7%
Processors	5.9%	41.5%	42.4%

Note: Current Growers Only

Source: Authorôs Mid-Atlantic Survey

Table 7.15 Percentage of Current Growers who Expect to Increase their Fresh Market Wholesale Sales in the Next Five Years by Sub-Region

Sub-Region	Percentage
Adams County	63.8
Cumberland Valley	33.3
West Virginia	31.8
Virginia	35.3

Note: Current growers only

Source: Authorôs Mid-Atlantic Survey

To accommodate the increased fresh market production of its growers, Rice Fruit has increased its packing line speeds, added new controlled atmosphere storage rooms, and will continue to expand capacity in the coming years (Rice 2010; Torres 2010; Lehnert 2012a). Bear Mountain Orchards and Bream Orchards have jointly built a new cold storage facility outside the town of Biglerville (Adams County, PA). While both Bear Mountain and Bream currently have their packinghouses located on their farms, the partnership plans to eventually build a new, modern packinghouse at the Biglerville location. The new facilities will allow the partnership to pack apples for the entire year (Source 1103 2010; Torres 2010; Growing Produce 2012). Currently, Rice Fruit is the only packinghouse in the Shenandoah-Cumberland Valley Fruit District that has enough volume and storage capacity to operate on a year-round basis. To compensate for reduced inventory in the spring and summer, Rice will import and repack apples from Chile (Warner 2006; Lehnert 2012a). In the future, John Rice, Vice President of Rice Fruit, foresees that all the Adams County packers will operate out of a single sales office with the possibility of further joint operations (Rice 2010). Further south, the Orr family of Berkeley County (WV) has recently reinvested in its packing line (Orrs 2010). Rockingham Countyôs (VA) Turkey Knob Growers has also recently expanded its volume in order to make necessary capital improvements (Glaize 2010a).

Despite the increases in the production of fresh market apples and the improvements to the Fruit Districtôs packinghouses, the region still faces a significant disadvantage when compared to the scale of the Washington packinghouses (Marini 2010; Rice 2010). Rice Fruit packs around 1.7 million bushels of apples but the rest of

the Fruit District packers are well below Riceôs production numbers (Marini Rice 2010; Lehnert 2012c). For example, Bear Mountain packs about 500,000 bushels of fruit and the Orr family packs over 400,000 bushels of fruit per year (Orrôs Fruit Market; Growing Produce 2012). By comparison, the state of Washington has packinghouses that have the capacity to pack 6ï 7 million boxes per year and the sales agency, Chelan Fresh Marketing, sells over 10 million boxes per year (CFM 2012). While Phil Glaize, owner of the Fred L. Glaize packinghouse in Winchester (VA), feels secure about the companyôs long-term contracts with its customers, he is worried that the continued consolidation occurring among grocery chains will result in fewer buyers who only want to deal with the largest packinghouses (Glaize 2010a).

Other Wholesale Opportunities

In addition to the traditional packinghouses shipping fruit to retail chain distribution centers and wholesalers, other opportunities exist for growers who wish to sell wholesale apples (Harper 2010). Some growers sort their fruit with low-tech, manual table graders or by hand and sell directly to local grocery stores and school districts (Guenthner 1993; Roth 1999; Tropp *et al*. 2008). Other growers will sell apples to independent truckers from places like North Carolina. These truckers may buy a load of apples from a local grower on speculation with the hope of selling the apples for a higher price in another market (CIPM 2007; Miller 2010). Roadside peddlers will also buy in bulk from a grower or packer (Orrs 2010).

Wholesale trade of apples and other fruit thrives among farm stands in the eastern United States (Kuhn 2010; Shanholtz 2010; Wenk 2010). For example, the Kuhn family

of Adams County (PA) will sell to farm stores from New York to the Carolinas. Many of their customers want the fruit to look like it just came off the farm so the Kuhnôs will directly harvest into the bins that will be placed onto the farm marketsô display floor (Kuhn 2010). Some of these ñfarm marketsò are just produce resellers and some are working farms but do not grow apples. Some farm markets do grow some apples but not at the volume needed to match their sales. Popular places like the Apple Barn in Sevierville, Tennessee supplement their orchardôs apples with apples from Rice Fruit while Orrôs (Berkeley County, WV) supplements the apple supply for Eckhartôs, a popular farm market in the St. Louis area (Orrs 2010). In addition, several area growers sell to Amish and Mennonite farm stands. Shanholtz Orchards in Hampshire County (WV) has a brisk trade with Amish communities in Ohio. Shanholtz even advertises in newspapers geared to the Amish community (Shanholtz 2010). In Adams County (PA), one of Three Springs Farmôs best customers is a Mennonite broker who sells Three Spring peaches and apples to Amish farm stands in Lancaster County, Pennsylvania (Wenk 2010).

Processing Market

The processing market is the most common outlet for the sales of apples grown in the Shenandoah-Cumberland Valley Fruit District. Almost 90 percent of the Fruit Districtôs growers send at least some of their apples to be processed (Table 7.16). This contrasts with the fresh wholesale market and direct-to-consumer sales both of which have only 60 percent grower participation rates (Table 7.12). Nearly 75 percent of the Fruit Districtôs growers produce at least some of their apples intentionally for the

processing market (Figure 7.13). This percentage is highest in Adams County (PA) where many growers are members of the Knouse Foods Cooperative, and lowest in the West Virginia sub-region (Table 7.13). For 31.1 percent of the Fruit Districtôs growers, processors utilize between 90ï 100 percent of all the apples that are produced in their orchards (Table 7.16). The emphasis on the processing market is highest in Virginia where 50 percent of the growers send at least 90 percent of their apples to the processors. An additional 22.7 percent of Virginia growers send between 60ï 89 percent of their apples to the processors.

Table 7.16 Survey Question: What percentage of your apple crop do you sell to processors?

Percentage of Crop	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
90ï 100%	31.1%	26.2%	21.7%	34.5%	50.0%
60ï 89%	28.9%	29.5%	39.1%	24.1%	22.7%
30ï 59%	15.6%	19.7%	13.0%	10.3%	13.6%
Under 30%	12.6%	13.1%	21.7%	10.3%	4.5%
Do not utilize these outlets	11.9%	11.5%	4.3%	20.7%	9.1%

Source: Authorôs Mid-Atlantic Apple Survey

In an era of stagnating processing prices and rising costs of inputs, cost containment and yield maximization are essential for maintaining a profitable operation (Harsh 2011). For example, the strategy of Fruit Hill, an operation with over 3,000 acres of processing apples in Virginia and West Virginia, is to grow a lot of large apples suitable for peeling while keeping its inputs as low as possible. Orchard treasurer Diane Kearns adds that Fruit Hill aims ñfor quantity over quality. Lean and mean on the labor force, you just get it done. If you get it done too well, youôre spending too much moneyò (Kearns 2010).



Figure 7.2 A Processing Orchard

These apples are being grown for Winchesterôs (VA) National Fruit Product Company to process into applesauce, slices, or other apple products; Berkeley Co. WV

Photograph by Joseph P. Guttmann

Growing for the processing market has different requirements than growing for the fresh market. For example, processing trees are generally not pruned every year or with as much detail as trees producing fresh market fruit (Marini 2010; Miller 2010; Wenk 2010). Unlike fresh apples sold to the general public, the outside appearance of a processing apple is not important because the apple ends up being peeled or crushed (Beidel 2009; Harper 2010; Wenk 2010; Harsh 2011). ñWe donôt bother keeping the fruit absolutely cleanò says Diane Kearns. ñSo if itôs just a defect that is going to be peeled off, the processor doesnôt careò (Kearns 2010). Growers save money by eliminating or decreasing the frequency of sprays on processing apples. For example, Fruit Hill may not use fungicides designed to alleviate superficial, external apple injuries but does use pesticides to prevent apple worms and other internal damage (Kearns 2010). Pennsylvania grower Ben Wenk adds that if he has a fresh market block and a processing block of apples showing the same level of injury, he will spray the fresh market block first and only spray the processing block if the problem gets decidedly worse (Wenk 2010).

One bone of contention expressed by some growers has been the tightening of grading standards by the processors. The processors are becoming less tolerant of bruising and other defects and are paying less for downgraded fruit (Burton 2010; Kitchen and Boarman 2010; Miller 2010; Source 1111 2010; Wenk 2010). Additionally, processors no longer accept dropped apples that have fallen from the tree to the ground but are still usable for juice and peeling. The non-acceptance of drops has lowered a

growerôs yield by rendering useless a previously a revenue source (Kitchen and Boarman 2010).

The more stringent grading standards are a function of the increased amount of apples being placed in long-term storage for processing purposes. Historically, the processing plants operated on a seasonal basis but, in an effort to spread out the processorôs labor requirements, the major companies have since moved to year-round processing. Because fruit with bruises and other defects tend to deteriorate in storage, the processors lose money storing poor quality fruit (Miller 2010; NFPC 2010). The processorsôwariness of storing poor quality fruit has only increased with the brown marmorated stink bug infestation of the last few years. Stink bugs can cause internal brown cork spots not readily apparent from external appearance of the apples (Van Meter 2010; Lehnert 2011c; 2012a; Leskey 2011; Smoot 2011). Some growersôthink that enforcing stricter standards is just a ploy by the processors to pay the growers less money for the apple crop and that the processors will use the apples in the same manner as in the past. The growers note that grade assessments have been the cause of some strained relationships between growers and the processors (Kitchen and Boarman 2010; Wenk 2010). Nonetheless, growers such as Fruit Hill have been adapting to the new standards by increasing the frequency of certain sprays (Kearns 2010).

Like most supplier/buyer relationships, the local growers and processors are mutually dependent upon each other but have different goals. A grower wants to maximize the returns earned on his or her apple crop while processors want to minimize their raw material input costs. Growers frequently grumble about the prices offered by

processors but also realize the consolidation of large grocery chains and the rise of low-cost mass marketers have left the processors with tighter margins and less negotiating maneuverability (Reany 2002; Mangino 2006b). Ken Guise, the CEO of Knouse Foods, acknowledges the challenges in balancing the interests of the growers, being fair to the factory employees, investing in capital projects to improve efficiencies, and earning profits for the company. He says decisions about the allocation of resources are his primary responsibility (Guise 2010).

On the mail survey, some growers commented they wished that market outlet options for processing fruit were more numerous to foster price competition. Low prices and the lack of true competition have been long-running concerns of growers. In 1952, the Federal Trade Commission investigated allegations of price fixing among the areaôs processors. It was determined that a competitive environment did exist but perceptions of a non-competitive market have persisted among some growers (Evans 1957).

Today, the bulk of the processing apples grown in the Shenandoah-Cumberland Valley are sent to the Fruit Districtôs three largest processors: Adams Countyôs (PA) Knouse Foods, Winchesterôs (VA) National Fruit Product Company, and Shenandoah Countyôs (VA) Bowman Apple Products. While many growers have an exclusive relationship with one of these companies, a number of growers split their crop among two or more processors (Ford 2008; Glaize 2010; Miller 2010). A small percentage of apples are processed at some of the Fruit Districtôs small-scale processors such as the Country Acres cider mill in Franklin County (PA). Small percentages of apples are also sent out of the Fruit District to baby food manufacturers, large cider mills, and other specialty

processors (Bennett 2004, Guise 2010; Kitchen and Boarman 2010; Source 1103 2010; Wenk 2010). Although Mottôs shut down its Adams County (PA) apple processing facility in 2007, some Fruit District growers continued to send apples to the Mottôs facility in New York until Mottôs canceled its contracts with Mid-Atlantic growers in 2011. Heavy frost damage in New York brought Mottôs back to the area seeking fruit in the 2012 season. It is too early to know how the growers will respond to the companyôs query and how much fruit Mottôs will continue to buy from Fruit District growers in the future (Harper 2010; Guise 2010; Kearns 2010; Molenda 2012).

Low grower returns in the processing market have many Fruit District growers switching their focus towards higher-value market outlets (Lehnert 2007b; Harsh 2011). In the next five years, 42.4 percent of the Fruit District growers expect a decrease in the percentage of their apple crop that is sold to processors (Table 7.14). Less than 6 percent of growers are expecting to increase the share of their crop sent to processors. Since 2001, the decline in the percentage of apples used for processing has been most pronounced in Pennsylvania and West Virginia (Table 7.17). The removal of several large, processing-only orchards contributed to West Virginiaôs decline while growers in Pennsylvania have made more of a concerted effort to grow apples geared to the fresh market (Source 3170 2004; Lehnert 2007a; Miller 2010; Harsh 2011). In Virginia, several processing growers have drastically downsized their apple acreage by keeping only the best processing blocks of trees and removing the rest in favor of other agricultural pursuits (Sokolowski 2002b; Withers 2005; Mangino 2006b; Kane 2008; Beidel 2009).

Table 7.17 Percentage of Statewide Apple Production Used for Processing

State	1975	1982	1991	2001	2009
Pennsylvania	54.7	65.0	73.2	75.0	64.8
Maryland	43.0	40.0	42.9	52.7	65.2
West Virginia	57.4	66.5	70.0	85.7	74.7
Virginia	61.0	65.6	76.2	71.2	75.5
Overall	**56.6%**	**64.0%**	**69.3%**	**73.9%**	**68.8%**

Source: USDA, NASS *Noncitrus Fruits and Nuts Summary* (various years)

Direct Marketing

By eschewing the fresh wholesale packinghouses, processors, and distribution centers, apple growers can earn higher margins on their fruit selling directly to the final consumer (Gale 1997; Govindasamy *et al*. 1999; Roth 1999; Burt *et al*. 2000; Gomez *et al*. 2010). For example, growers can earn $75 to $100 a bushel selling apples at a farmers market in Washington, D.C. but only $8 to $13 a bushel selling similar quality fruit through a packinghouse. Canner-quality apples only sell around $5 a bushel to a processor (Weinraub 2005; Rice 2010; Source 5001 2010; Wenk 2010; Lehnert 2011c). The potential for higher profit margins is tempered, however, by the volume constraints that can be sold through these outlets (Rowles 2001a; King *et al*. 2010). Although only a very small percentage of the total apple crop grown in the United States is sold through direct means, the impact of these sales are important to the bottom-line of growers who use these methods (Schotzko 2004; O'Rourke 2009; Gomez *et al*. 2010; King *et al*. 2010; Martinez *et al*. 2010). Direct marketing is used by operations of varying size. It can be a complementary or supplementary component of a diversified market mix when combined with fresh wholesale and processing outlets or it can be the main marketing focus of an

operation (Burt *et al*. 2000; Che 2006; Musselman 2009a; Gomez *et al*. 2010). Some apple regions such as New England rely more on direct sales for the health of the local industry than others (Miller 2010). For orchards located outside the main apple-growing regions and far from a packinghouse or processor, direct sales may be the only marketing option.

One of the most basic forms of direct marketing is on-the-farm retail sales. On-the-farm retail can range from growers that seasonally sell apples out of the barn to elaborate, year-round stores that feature a wide range of produce and entertainment options (Roth 1999). Attractive fruit, a clean facility, a roadside sign, and word-of-mouth advertising may be all that is needed for the most basic operations while others rely on a more comprehensive advertising strategy (Dunn *et al*. 2006). Most farm stands will have an assortment of varieties available to purchase. These include various shades of reds, greens, and yellows; sweet or tart apples; and apples that are good for eating, cooking, or both. One attractive feature for customers is that on-the-farm retail outlets will often offer varieties that are not readily available in supermarkets (Gomez *et al*. 2010). Beginning with Lodi in July and ending with Pink Lady (Cripps Pink) in November, growers can extend their retail season by producing apples with different harvest dates (Lehnert 2010a). Growers can also extend their season by diversifying their produce options. Peaches, berries, and cherries are popular items at farm stands prior to apple season while pears complement apples during the fall (Oates 2007; Gomez *et al*. 2010). Some growers will even bring in produce from other regions to sell while their own fruit is still immature (Burt *et al*. 2000; Dunn *et al*. 2006). Value-added products such as

apple butter, jams, cider, and baked goods are also offered at some retail outlets to increase revenues and profits (Adam 2004; Veeck *et al*. 2006). Some of these value-added products are made on the farm while other growers take their fruit to local processors that will process and package products that will then be sold under the orchardôs private-label (Orrs 2010). Larger markets will often sell other processed food product lines that are targeted to sell at farm stands as well as ñcountry-styleò crafts and other items with farm or apple motifs (Figure 7.3) (Gale 1997; Adam 2004).

Location, the scale of the enterprise, and the target market are major considerations in how the grower can position his or her retail outlet (Burt *et al*. 2000). In addition to fresh produce, those growers trying to cater to tourists or those located on out-of-the-way secondary roads but still within driving range of a sizable population may need to become ñdestinationsò by offering other attractions to entice customers (Roth 1999; Adam 2004; Dunn *et al*. 2006). Attractions may include wagon rides, exotic animals such as bison on display, play areas for children, petting zoos, seasonal corn mazes, and annual festivals. School and other group tours of the farm may also be available (Roth 1999; Adam 2004; Oates 2007). These agritourism destinations are not only trying to earn the customersô food dollar but are vying for their entertainment dollars as well (Roth 1999). Customers come because they value the ñexperienceò of the farm (Adam 2004; Veeck *et al*. 2006).



Figure 7.3 On-The-Farm Retail

Left ï The distinctive Historic Round Barn and Farm Market; Adams Co. PA *Right* ï Inside the Round Barn. In addition to apples and other fruit many farm markets like the Round Barn sell knick knacks and value-added food products such as sauces and jams

Photographs by Joseph P Guttmann

One direct marketing technique that can be part of a larger ñagritainmentò complex or done separately is a U-pick/pick-your-own operation (Adam 2004). In a business strategy taken from *Tom Sawyer*, visitors can pay for the opportunity to pick their apples from a tree or berries from a bush (Hart 1991). What was once a business cost for the grower, harvesting, has become a revenue stream, albeit on a smaller scale (Adam 2004). Parents, in particular, value the opportunity for a hands-on educational outing with their children (Che *et al*. 2005b; O'Rourke 2009). Pick-your-own operations have a number of drawbacks. Pick-your-own orchards are dependent on having good weather to attract customers during a limited harvest window. U-picks are time-intensive for customers and like farm stands, the distance that customers will drive to pick-their-own produce is limited (Govindasamy *et al*. 1999). These operations have high liability costs and with apples, the question is whether or not to allow customers to use ladders

(Burt *et al*. 2000). Another problem is that customers are not efficient pickers so waste occurs with fruit left on the tree or dropped (Burt *et al.* 2000; Adam 2004; Dunn *et al*. 2009).

One effective alternative to on-the-farm retail is for growers to attend farmersô markets. Farmersô markets are an especially good option for growers who want to tap the direct-to-consumer market but do not have the time or capital to invest in their own farm stand or whose farmôs location does not make on-the-farm retail feasible either due to an isolated location or local market saturation (Roth 1999; Dunn *et al.* 2009). Farmersô markets are centrally located spaces where farmers gather at specific times to sell their products (Martinez *et al*. 2010). Facilities for these markets can range from a dedicated permanent structure to tailgates and portable tables in parking lots or town squares (Gale 1997; Burt *et al.* 2000). While prices will vary from market to market, the higher demand for fresh produce in urban and suburban markets generally results in farmers receiving higher prices than in rural or smaller town markets (Govindasamy *et al.* 1999; Wenk 2010). The agglomeration of fresh products at a farmersô market attracts customers from a wider area than the typical supermarket (Gale 1997). On the other hand, the same agglomeration that attracts customers also attracts competitors who may be selling the same type of apples with similar displays (Burt *et al*. 2000; Dunn *et al*. 2009; Gomez *et al*. 2010). Other potential drawbacks to farmers markets are the preparation and travel time involved for each market. In addition, poor weather on market days may lead to unsold products that cannot be sold at the next market day (Dunn *et al*. 2009).

Another direct marketing tactic is community-supported agriculture (CSA). CSA is a subscription service where the consumer pays the farmer an up-front fee at the beginning of the season and the farmer provides the consumer with an allotment of whatever fruits and vegetables were harvested that week. In this manner, consumers share some of the natural risks to farming as the up-front fee is collected regardless of the quantity and quality of the produce harvested (Gale 1997; Burt *et al.* 2000; Martinez *et al.* 2010). The risk that is spread to the consumer is partly overcome by the focus of many CSAs on growing chemical-free, natural foods, an appealing attribute for many of their patrons (Gale 1997; Roth 1999; Burt *et al.* 2000). CSAs tend to be small farms that produce a wide variety of produce. This diversified approach means that their output of apples is usually quite small.

Almost 60 percent of the growers in the Shenandoah-Cumberland Valley Fruit District sell at least some apples directly to the public (Table 7.18). The high percentage of growers (39.3 percent) that sell less than 30 percent of their crop via direct means suggests that for those growers, direct marketing is a complementary or supplementary activity. Given the higher margins in the direct market sector and the stagnation in processing prices, direct sales represent a higher percentage of a growerôs total revenue than what the actual volume of apples diverted to the direct market would suggest. Even in a complementary or supplementary role, the presence of high-margin direct sales is often the difference between the grower making a profit or loss for the year. Several growers claim that placing more emphasis on direct marketing outlets has transformed their formerly marginally profitable operations into financially healthier ones today

(Burros 2005; Source 1069 2012). Developing and managing direct marketing opportunities has also enticed many young adult children of growers to remain on the farm and allows these young growers to contribute new cash flow to the operation of the family farm (Lehnert 2007c; Guise 2010; Kuhn 2010; Wenk 2010; Abram 2011).

Direct sales are the primary outlet by volume for only 12.6 percent of the Fruit Districtôs growers (Table 7.18). That all of the farms that sell 60 percent or more of their apples through direct sales have 30 acres of apples or less is as indication of the volume constraints of direct marketing. Only one farm that has over 80 acres in apples sells over 15 percent of its crop through direct means.

Breaking the numbers down geographically, the sub-region with the highest grower participation rate in direct marketing is the Cumberland Valley with 78.3 percent while both West Virginia and Virginia have participation rates in the mid-60 percentage range (Table 7.18). Surprisingly, less than one-half of the responding growers from Adams County indicated that they sell through direct means. This may just be a function of the higher number of growers in the county compared to the other sub-regions. A market area can only absorb so much local product and other growers may not be willing to drive long distances to attend farmersô markets.

Table 7.18 Survey Question: What percentage of your apple crop is retailed on the farm, at farmers' market, or through other direct marketing outlets?

Percentage of Crop	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
90ï 100%	10.4%	9.8%	8.7%	13.8%	9.1%
60ï 89%	2.2%	0%	8.7%	3.5%	0%
30ï 59%	7.4%	6.6%	4.3%	13.8%	4.5%
Under 30%	39.3%	31.1%	56.5%	34.5%	50.0%
Do not utilize these outlets	40.7%	52.5%	21.7%	34.5%	36.4%

Source: Authorôs Mid-Atlantic Apple Survey

The most common form of direct marketing in the Shenandoah-Cumberland Valley Fruit District is operating a retail outlet on the farm (Table 7.19). Growers in the Cumberland Valley topped the other sub-regions with 59.3 percent having retail sales on the farm. Within the Cumberland Valley sub-region, the Maryland operations stood out with 76.9 percent having retail operations. This contrasts with Adams County where only 21 percent have on-the-farm retail sales. When I asked two Adams County growers why they attended farmersô markets in the Washington, D.C. area instead of opening up their own retail operation, they both responded that they did not want to compete against several well-established, on-the-farm fruit markets in the county. In addition, one grower

pointed out that many long-time Adams County residents obtained fruit from relatives who owned orchards (Kuhn 2010; Wenk 2010). Operating a retail stand also engenders more risk than just growing fruit as the closure of long-time fruit markets in Hancock (Washington County, MD) and Kearneysville (Jefferson County, WV) attests.

One way to attract more patrons to a retail stand is to offer agritourism activities such as farm tours, petting zoos, wagon rides, and corn mazes. Only one-quarter of the farms that have retail operations offer agritourist activities to their customers (Table 7.19). Virginia and West Virginia have the highest percentage of farms that offer agritourist activities, while once again Adams County has the lowest percentage. This is surprising given the nearness of the South Mountain Fruit Belt to the Gettysburg battlefield, a national tourist destination. A question about pick-your-owns was asked separately because pick-your-owns are often the only agritourism activity offered by an operation. Less than 50 percent of the growers that had pick-your-owns also offered other agritourist activities. About 30 percent of the growers that offer pick-your-owns do not even have a retail outlet on the farm. Within the Fruit District, 13.8 percent of all growers provided pick-your-own opportunities for customers on their farm and the percentages were pretty even across the sub-regions. Not all of the growers who indicated that they have pick-your-owns have pick-your-owns for apples. Some growers just offer pick-your-owns for berries or other fruit (Orrs 2010, Source 3199 2012).

Table 7.19 Percentage of Growers Who Use the Following Direct Market Outlets

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Have a retail outlet on your farm	37.2%	21.0%	59.3%	48.5%	39.1%
Offer entertainment options such as tours, hayrides	9.7%	4.8%	7.4%	15.2%	17.4%
Offer a pick-your-own option for customers	13.8%	11.3%	18.5%	15.2%	13.0%
Sell at farmers market	31.7%	29.0%	25.9%	39.4%	34.8%
Advertise your products to the general public	40.0%	25.8%	59.3%	54.5%	34.8%

Note: Percentages will not add up to 100 percent. Growers were allowed to select more than one statement.
Source: Authorôs Mid-Atlantic Apple Survey

Farmersô markets are another popular means of selling apples directly to the public. Over 31 percent of the respondents attend at least one farmersô market (Table 7.19). A 15 percent spread was found among the sub-regions, with West Virginia having the highest percentage and the Cumberland Valley having the lowest percentage. Growers attend a wide range of farmersô markets in the area from small local affairs with only a few vendors to large regional farmersô markets that may attract growers from five different states. Many of the larger and more profitable farmersô markets are located in Washington, D.C., Baltimore, or in the suburbs of these cities (Figure 7.4). At least 25 growers from the Fruit District make the one-to-two hour, one-way trek to these locales. Three growers drive three hours to markets in Philadelphia while one grower goes all the

way to Rehobeth Beach, Delaware. Growers from the Fruit District tolerate the extended drive times because the prices received at these city and suburban markets are higher than what would be earned selling fruit at farmersô markets within the Fruit District (Source 5001 2010; Wenk 2010). Other growers are content attending farmersô markets within the Shenandoah-Cumberland Valley Fruit District in towns and cities such as Gettysburg (PA), Hagerstown (MD), Berkeley Springs (WV), Romney (WV), Winchester (VA), and Harrisonburg (VA). At least 20 growers attend more than one farmersô market per week. Operating an on-the-farm retail outlet and attending farmersô markets is not an either/or proposition as over one-half of those that attend farmersô markets also have a retail outlet on the farm.



Figure 7.4 Farmers' Market in Washington, D.C.

The Spring Valley Farm and Orchard of Hampshire County, WV sells its produce at a farmersô market located two blocks from the White House. Also attending this farmersô market were apple growers from Cumberland County, PA and Jefferson County, WV

Photograph by Joseph P. Guttmann

Less common forms of direct retailing include the direct mailing of fruit, alternate forms of agritourism, and community-supported agriculture (CSA). Several farm markets, as well as the Turkey Knob Growers packinghouse in Rockingham County (VA), mail out gift boxes of apples. On busy days, Orrôs Farm Market will mail out as many as 100 gift boxes (Orrs 2010). Another farm market, Gray Wolf Plantation in Adams County (PA), specializes in gift boxes of heirloom apples. The Gray Wolf Plantation offers standard agritourism activities such as a corn maze and pumpkin patch but other Fruit District apple-growing operations offer some non-traditional agritourist activities (GWP 2011). At least four operations offer overnight accommodations on the farm. Most offer a place to ñget awayò amidst a scenic orchard farmscape. One orchard operation in Berkeley County earns extra revenue by running organized bird hunts on the farm during the non-growing season. Around 3,500 hunters used the farm in 2008 (Smoot 2008a). Less than ten operations offer CSA subscriptions to customers. Two are small, diversified organic farms, each having less than two acres in apples. Two traditional orchard operations have recently started CSA services for both local customers and their customers at the Washington-Baltimore area farmersô markets. Another farm does not have its own CSA but offers its organic apples through other local CSAôs that do not produce apples.

Finally, another way that direct marketers differ from those growers that rely primarily on processing or even some that wholesale is by advertising directly to the public. Only 40 percent of the growers in the Shenandoah-Cumberland Valley Fruit

District advertise their products to the general public (Table 7.19). The sub-regions with the highest amount of growers that advertise to the general public are the Cumberland Valley with 59.3 percent and West Virginia with 54.5 percent. On the other hand, only 25.8 percent of the Adams County respondents advertise to the public. None of the 24 respondents that sent 99 or 100 percent of their crop to the processors advertise to the public because it is not necessary. Many, but not all, growers who are involved in direct-to-the-public retailing maintain their own websites or at least have farm descriptions posted on larger sites such as freshfarmmarket.org or Facebook. One important aspect of advertising through orchard signs, print and radio ads, and web pages is that it raises the visibility of the fruit industry in the general community. Even growers of processing apples intended for National Fruit have placed signs by the roadsides of their orchards that say ñFrom these fields to Your Homeé White House.ò The connecting of names with land uses could come in handy when the community needs to decide on issues impacting the fruit industry.

Examples of On-the-Farm Retail from the Eastern Panhandle

Looking at three operations in West Virginiaôs Eastern Panhandle will highlight the different on-the-farm retail approaches taken by growers in the Shenandoah-Cumberland Valley Fruit District. Butlerôs Farm Market is strictly a large produce market, Orrôs Farm Market offers many agritourist activities, while the Miller family sells fruit out of the barn (Figure 7.5). Benefiting from a nice location, Butlerôs Farm Market is a straight two-mile drive off of Interstate 81 in central Berkeley County (WV). The market is far enough out for it to be rural but close enough to the city of Martinsburg

(WV) and the interstate interchange to be convenient (Kitchen and Boarman 2010). Butlerôs started the farm market in 2002 and expanded with a much larger building within the past five years (Butlerôs Farm Market 2011). In addition to fruit and vegetables, the market offers processed food products, a few bakery items, wood furniture, flowers, and mulch. The market does not offer any agritourist activities. Butlerôs Farm Market advertises in the local newspaper, radio, and is a visible supporter of local high school sports. Most of Butlerôs apples are sold to the processors but a limited amount of their total apple crop is sold at their market or wholesale to other East Coast farm markets.

With over 900 hundred acres of fruit, George S. Orr & Sons is the largest orchard operation in the state of West Virginia. The majority of their fruit is sold wholesale through their own packing operation. Since the building of their farm market in the mid-1990s, Orrôs has seen its direct sales increase to about eight percent of its annual revenues. Located about six miles west of Martinsburg on Apple Pie Ridge in southern Berkeley County, Orrôs has incorporated agritourist activities to attract customers to their more isolated locale. Orrôs has popular pick-your-own berry and cherry options but does not offer pick-your-own peaches or apples because of insurance issues. Orrôs has a harvest festival, conducts tours for school groups and offers a twilight tour for the general public. The twilight tour consists of a guided wagon ride around the orchard followed by a dinner on the grounds with members of the Orr family. The Orr family also maintain longhorn cattle, peacocks, and a 14-head bison herd (Figure 7.5). The bison are used to make the visit more memorable for customers and feeding apples to the bison is a highlight of the tours. The farm market has its own in-house bakery and also offers a

wide selection of heirloom apples. Orrôs Farm Market advertises through radio, the local ñBuyerôs Guideò newspaper, and has a strong web presence. Orrôs sends out a weekly e-mail newsletter and utilizes a direct mailing three times a year (Orrs 2010).

Selling fruit out of their barn, the Miller Family of Kearneysville (Jefferson County, WV) represents a more traditional approach to on-the-farm retailing (Figure 7.5). The Millers have a no-frills operation. They offer no agritourist activities and no value-added products; they just sell apples, peaches, and cherries. While the Millers will place an ad in the local Martinsburg (WV) and Hagerstown (MD) newspapers, the farm relies mostly on word-of-mouth and a sign placed on the side of its well-traveled road location. The Millers do not have a presence on the internet. Currently less than 20 acres in size, the Millersô orchard holdings are less than half of what they operated in the past. The Millers will continue to downsize their apple acreage in order to lower their need for labor. About 80 percent of the harvested apples are now sent to the processors but their long-term goal is to sell all of their apples via on-the-farm retail sales. The Millers hope that by selling fewer apples at higher margins, they can make just as much money as selling a whole lot of apples at low price points (Miller 2010).



Figure 7.5 Examples of On-The-Farm Retail in the West Virginia Sub-Region

Top ï Butlerôs Farm Market, a large on-the-farm produce market; Berkeley Co. WV *Center Row* ï Orrôs Farm Market offers many agritourism activities such as pick-your-own strawberries and the viewing of bison; Berkeley Co. WV *Bottom Row* ï The Miller family sells their apples directly out of the barn; Jefferson Co. WV

Photographs by Joseph P. Guttmann

The Butler and Orr family farm markets represent a new form of on-the-farm retail marketing for orchards in Berkeley County, WV. Where previously growers would sell fruit at small roadside stands or out of their barns like the Millerôs, the new markets are larger stores and offer a greater array of products than apples and peaches. To attract more customers throughout the year, the farms have diversified and now grow vegetables, berries, and a greater number of apple and peach varieties (Kitchen and Boarman 2010; Orrs 2010). In addition to produce, both Orrôs and Butlerôs offer similar lines of processed food products sold under their own private labels. The two markets also sell several lines of branded products typically found in farm markets and local bottled milk and other dairy products from the Trickling Springs Creamery in Chambersburg, PA. Selling these value-added products enhances the shopping experience by giving customers a greater choice of products and is a further step to diversifying farm revenues to lessen the reliance on commodity prices in the processing and wholesale markets.

One other trend in recent years is the increase in the number of signs along the road advertising ñdeerò or ñwildlifeò apples for sale. Popular with hunters, deer apples are apples that are sold at discounted prices for the purpose of feeding to wildlife or farm animals. Selling juice-quality apples as ñdeer applesò provides growers a higher-value alternative than selling the same apples to the processor. Deer apples are also a viable outlet for the dropped apples that are no longer accepted by the processors (Kitchen and Boarman 2010; Shanholtz 2010; Source 1241 2010).

Farm Reinvestment

The long-term future of the apple industry in any area depends largely on the decision of the growers to continue to reinvest in their farm. If growers continue to reinvest in their operations then there is a strong probability that the apple industry in a region will remain vibrant. On the other hand, if many growers decide not to reinvest in their operation, then the region will eventually experience a collective decline. Growers were asked if they were optimistic about the future of apple-growing in their area and the importance of maintaining their lifestyle of working on the farm. These two personal perspectives should be good indicators of the likelihood of the continued reinvestment in the farm or an eventual exit from the apple industry.

A growerôs level of optimism is a result of various factors at the macro, regional, and farm-level scales. The long-term price projection of apples, availability of labor, intensity of development in the area, and whether the next generation will succeed the current generation are all factors for a grower to consider. In the Shenandoah-Cumberland Valley Fruit District, the levels of grower optimism exhibit sharp geographic contrasts (Table 7.20). Growers in Adams County (PA) and the Pennsylvanian counties of the Cumberland Valley sub-region were, on average, more optimistic about the future of apple-growing in their area than were the growers in the Virginia sub-region. Over 50 percent of Adams County growers responded that they were very optimistic or somewhat optimistic about the future compared to 21.7 percent of Virginia growers who answered the same way. In contrast, 56.5 percent of growers in Virginia expressed somewhat or very pessimistic feelings about the future of apple-growing in their area. Less than 25

percent of Adams County growers were pessimistic. Tree fruit specialist Rich Marini who has worked at both Virginia Tech and Penn State is in a good position to compare the two sub-regions. Marini said that when he left Virginia Tech in 2004, grower morale in Virginia had been pretty low for a number of years. He attributed the low morale mostly to continued low prices. In contrast, he noted that the growers in Adams County (PA) have been much more enthusiastic about the future of the apple industry. Many growers are adapting new production and marketing strategies and a new generation of growers have become involved in the industry (Marini 2010). For the entire Fruit District, growers were slightly more optimistic than pessimistic about the future of apple-growing in their area, but just barely (Table 7.20).

Growers in the Virginia sub-region and growers in the other three sub-regions exhibit marked differences over the importance of maintaining the lifestyle of working on the farm (Table 7.21). Nearly three-quarters of the growers in Adams County and the Cumberland Valley, and almost two-thirds of the West Virginian growers expressed that the farm lifestyle was ñveryò important to them. The majority of the Virginian growers responded that the farm lifestyle was ñsomewhatò important or were neutral on the topic.

Table 7.20 Survey Question: Are you generally optimistic or pessimistic about the future of apple-growing in your area?

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Very optimistic	14.9%	20.0%	18.5%	9.7%	4.3%
Somewhat optimistic	29.8%	31.7%	37.0%	29.0%	17.4%
Neutral	19.1%	25.0%	7.4%	16.1%	21.7%
Somewhat pessimistic	24.1%	15.0%	25.9%	35.5%	30.4%
Very pessimistic	12.1%	8.3%	11.1%	9.7%	26.1%
Average	**3.11**	**3.40**	**MD 2.69 / PA 3.78**	**2.93**	**2.43**

Note: Average score based on a 5 point scale where 5 = Very optimistic and 1 = Very pessimistic

Source: Authorôs Mid-Atlantic Apple Survey

Table 7.21 Survey Question: How important is maintaining your lifestyle of working on the farm?

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Very important	64.2%	73.7%	73.9%	63.6%	22.2%
Somewhat important	25.8%	19.3%	26.1%	27.3%	44.4%
Neutral	6.7%	5.3%	0%	4.5%	22.2%
Not important	3.3%	1.8%	0%	4.5%	11.1%

Note: Current growers only

Source: Authorôs Mid-Atlantic Apple Survey

Farm Succession

Most fruit farms in the Shenandoah-Cumberland Valley Fruit District have been in the same family for several generations. According to the mail survey, almost 70 percent of fruit farms have been operated by the same family for at least 50 years. Inheriting or purchasing the farm from a close relative is the most common way to obtain farm acreage. Nearly 75 percent of the growers obtained their land in this manner. Only 10 percent of Fruit District growers have added to the land obtained from close relatives by purchasing land from non-relatives. Almost 25 percent of the respondents did not inherit or purchase land from close relatives but purchased their land from non-relatives. Growers also obtain land through lease agreements but because the wording on the survey caused confusion among the growers, leasing results are not included.

One of the effects of development pressure is that the resulting high land prices make it very difficult for young, new growers to enter into the apple-growing business as an owner-operator. The up-front investment costs to purchase land and equipment are often too steep for someone starting fresh out of the block (Daniels 2000; Ferry and Brock 2003; Source 1027 2010). It is easier for a child of a grower to share equipment and to purchase or transfer assets over an extended period of time (Kuhn 2010). Options for potential young growers who do not come from an established orchard family include leasing land and working off the farm while building equity or becoming an orchard manager but not an owner (Baugher 2010; Kuhn 2010). One young grower chose to move from a county with significant development pressures to Hampshire County (WV) where the land was less expensive (Source 5001 2010). As land prices have risen and the

apple industry experienced economic difficulties, entering the business by purchasing land from non-relatives has become rare. Within the past 15 years, only six survey respondents, or 4.3 percent, have entered the business through the purchase of land from a non-relative.

A grower will be more likely to continue to replant trees and upgrade the orchard if he or she knows that a son or daughter will be taking over the farm (Bryant and Johnston 1992; Smithers and Johnson 2004). Once again, the expectations of a family member or other close associate eventually taking over the farm upon the growerôs retirement are geographically distinct (Table 7.22). Over 60 percent of the respondents from Adams County expect a son, daughter, relative, or close associate to eventually take over their farm operation. On the other hand, 45ï 55 percent of the growers in the Cumberland Valley, West Virginia, and Virginia sub-regions do not expect a family member or close associate to take over the farm upon their retirement. A few growers in West Virginia and Virginia said that they do not see many young growers in their areas coming back to the farm (Kearns 2010, Miller 2010). As one grower put it,

> ñif the farms are making money, then young people will be more inclined to take over the farms. If the farms are not making money, then the young person will go off and do something else for a livingò (Glaize 2010a).

Table 7.22 Survey Question: Do you expect a son, daughter, other relative, or close associate to eventually take over the operations of your farm?

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Yes	41.5%	61.3%	29.6%	29.0%	18.2%
No	36.6%	21.0%	44.4%	54.8%	45.5%
Unsure	21.8%	17.7%	25.9%	16.1%	36.4%

Source: Authorôs Mid-Atlantic Apple Survey

Some growers may not even want their children to come back to the farm (*Fruit Growers News* 2007; Source 5003). As said by one Virginia grower ñItôs certainly not an industry I want my daughters in. If one of them came home with a boy that wanted to be in the apple industry, Iôd write him off real quick. Iôd say ógirl, youôve got better sense than thatôò (Kane 2008). Another 20 percent of the Fruit Districtôs growers are ñunsureò about their potential successor (Table 7.22). Many fruit-growing parents neither encourage nor discourage their children from a vocation in the fruit industry. The parents want their children to follow their own interests. For example, many children of fruit growers are not involved in agriculturally-themed youth organizations (Glaize 2010a; Miller 2010; Wenk 2010).

Young Growers Alliance

Like the other sub-regions, some people in Adams County (PA) felt that a generation of potential growers did not come back to the farm (Guise 2010). Recently, a renewed interest in fruit-growing among young people has been sparked by the emergence of the Young Growers Alliance (YGA). In the mid-2000s, two Adams

County (PA) extension educators noticed that many children of established fruit-growing families were unsure or wavering about going into the fruit business. These children had grown up helping out on the farm but many had gone off to college and majored in degrees other than agriculture (*Fruit Growers News* 2007). The educators also sensed that the younger generation did not really know each other. ñI knew my dadôs generation,ò said young grower Sidney Kuhn, ñ(but) I had no clue of anyone in my generation that was interested in fruit-growingò (*Fruit Growers News* 2007; Kuhn 2010; Abram 2011). As a result, the YGA was founded in 2005 as a mechanism to pull potential young growers back to the farm and to serve as a support group to keep the new growers excited about their career choice (*Fruit Growers News* 2007; Sparks 2012).

The YGA is an educational and networking group for young adults in the early stages of their careers in the fruit industry. Field trips are one of the primary ways the young growers learn about new production and marketing strategies (Figure 7.6). In addition to touring many local orchards, the group has traveled to places as far as New York, Washington, and New Zealand to gain an understanding of common practices in other competing apple-growing regions (Kuhn 2010; Abram 2011; Sparks 2012). Several young growers have applied technologies to their own operations that they first learned about on field trips. For example, two growers have installed high-tunnels for sweet cherry production after seeing the systems on field trips to Massachusetts and eastern Pennsylvania (Abram 2011).



Figure 7.6 Young Grower Alliance Field Trip

Members of the YGA listen to Mike Glenn, the director of the USDA Appalachian Fruit Research Station in Kearneysville, WV. I am standing to the far right, notebook in hand; Jefferson Co. WV
Photograph by Tara Baugher

Another important outcome of the field trips has been the development of support networks and working relationships among peers (Kuhn 2010; Wenk 2010; Sparks 2012). Former YGA Chairperson, Sidney Kuhn says,

> ñIt is so comforting to know that if I have a question I can call (another young grower) and they are not going to think Iôm an idiot because I donôt know this already. It makes you feel like you are a part of a group and that you are not the only person out there that is trying to take on this thing of owning a fruit-growing business. There are other people out there that are having the same problems as you are havingò (Kuhn 2010).

Whereas previous generations had been protective of their trade secrets, the sharing of production and marketing strategies has fostered a more cooperative spirit among the younger generation (*Fruit Grower News* 2007; Sparks 2012).

Apparently, there was a pent-up need for an organized network of young growers because the YGA quickly spread beyond the borders of Adams County (PA). Today the YGA has approximately 175 members. Most members live in Adams County (PA) but others live as far away as New England and Canada (*Fruit Grower News* 2007; Baugher 2010; Sparks 2012). For example, at a field trip hosted by the YGA members of the Orr family in Berkeley County (WV), I sat next to a young grower from Connecticut. While several YGA members live in West Virginia and Virginia, no indigenous groups for young growers are found in those states. When asked about the possibilities of a YGA-like group starting in their sub-region, two growers in West Virginia and Virginia thought, that compared to Adams County (PA), their areas lacked the critical mass of young growers needed for such a program to thrive (Glaize 2010a; Miller 2010).

The Young Growers Alliance is an innovative program that according to Knouse Foods CEO, Ken Guise, ñis the envy of every other grower group in the United States.ò When speaking to growers from other apple-growing districts, these growers ñwould say óyou got young growers?ôalmost in shocked surprise. But it kind of woke up the industryò (Guise 2010). The success of the YGA has spawned other similar organizations such as the Future Fruit Growers of Lake Ontario (Lehnert 2010d, 2010e; Rivers 2010). The Young Growers Alliance also inspired the creation of the U.S. Apple Associationôs Young Apple Leader Program (Foster 2010; Sparks 2012).

The success of the Young Growers Alliance is an important factor in explaining the disparity between farm succession expectations in Adams County (PA) compared to the rest of the Fruit District (Table 7.22). The YGA has also contributed to Adams Countyôs high percentage of growers who are optimistic about the future of apple-growing in their area (Table 7.20). Tara Baugher, Adams County (PA) extension educator and co-founder of the YGA, noted that ñonce the young growers started to come back, it gave (the older generation) a reason to be excited about growing fruit againò (Baugher 2010). Both the dean of the horticulture department at Penn State and the CEO of Knouse Foods mentioned that the growth of the YGA is what makes them most excited about the continued future of the apple industry in Pennsylvania (Guise 2010; Marini 2010). One indication of the value that the Pennsylvania apple industry places on the next generation is that members of the YGA have been put on the board of directors of the State Horticultural Association of Pennsylvania and the Pennsylvania Apple Marketing Board (*Fruit Grower News* 2007; PAMP 2010; Wenk 2010; Abram 2011; SHAP 2012).

Past Farm Investments

Over the past 15 years, there has been an even distribution of growers in the Fruit District who have increased acreage, decreased acreage, or maintained their current level of farm operations (Table 7.23). The greatest geographic distinction is between Adams County and the Virginias. Over 50 percent of the respondents from both West Virginia and Virginia have decreased their apple acreage compared to less than 20 percent of Adams County growers. Following a string of years of poor weather and poor prices, a

number of processing growers in Virginia have pared back their orchards to all but the most productive trees (Sokolowski 2002b; Withers 2005; Kane 2008).

The likelihood that a grower has increased his or her acreage over the past 15 years improves with the growerôs expectation of a child or close associate eventually taking over the farm. Over 55 percent of the growers in the Fruit District who have increased their apple acreage in the past 15 years expect a child or close associate to take over the farm upon their retirement (Table 7.24). Among growers who have decreased their apple acreage, only 20.8 percent have a known successor. A similar pattern exists with farmstead apple acreage change and levels of optimism. Over 62 percent of those growers who had increased their apple acreage in the past 15 years were ñsomewhatò to ñveryò optimistic about the future of apple-growing in their area. In contrast, optimism levels dropped to 27.1 percent for growers who had decreased their apple acreage in the same time period.

Table 7.23 Growers Reporting Changes in Apple Acreage Within the Past 15 Years

Apple Acreage Change, By Farm	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Increased acreage	31.9%	42.6%	36.0%	16.7%	18.2%
Maintain current level of farm operations	33.3%	39.3%	32.0%	26.7%	27.3%
Decreased acreage	34.8%	18.0%	32.0%	56.7%	54.5%

Source: Authorôs Mid-Atlantic Apple Survey

Table 7.24 Changes in Apple Acreage by Growers' Farm Succession Expectations and Growers' Outlook on the Future of Apple-Growing in the Area

Apple acreage change, by farm, in past 15 years	Expects child to take over farm	Does not expect child to take over farm	Has a "somewhat" or "very" optimistic outlook about the future of apple-growing in area	Has a "somewhat" or "very" pessimistic outlook about the future of apple-growing in area
Increased acreage	55.8%	20.9%	62.8%	18.6%
Maintain current level of farm operations	47.8%	34.8%	45.7%	37.0%
Decreased acreage	20.8%	54.2%	27.1%	50.0%

Source: Authorôs Mid-Atlantic Apple Survey

In terms of farm reinvestment, one of the starkest geographic contrasts between Adams County and the Virginias is the year in which growers last planted trees (Table 7.25). Over 80 percent of current growers from Adams County have planted trees within the last two years compared to 35 percent of West Virginia growers and 44 percent of Virginia growers. By contrast, only 7 percent of current Adams County growers have waited longer than five years to replant compared to over 40 percent for growers in the Virginias. Because the replanting of trees is a long-term capital investment, numerous factors can help explain these geographic disparities. One possible explanation lies in the fact that a higher percentage of Adams County growers than West Virginia or Virginia growers utilize the fresh wholesale markets (Table 7.12). Generally, orchards geared towards the fresh wholesale markets have shorter economic lifespans than processing orchards. Growing for the fresh market necessitates frequent replanting of portions of the orchard in order for growers to stay current with their varietal mix (OôRourke 1994; Schotzko 2004; Marini 2010; Harsh 2011). However, even 60 percent of the processing

growers in Adams County (those growers that send at least 85 percent of their apple crop to the processors) had replanted within the past two years. This contrasts with the 50 percent of processing growers in the Virginias that had not replanted within the past five years. The difference may be attributed to grower optimism. Eight of the nine processing growers in Adams County who had replanted within the past two years expressed an optimistic or neutral outlook on the future while eight of the nine processing growers in the Virginias who had not replanted in more than five years had a pessimistic or neutral future outlook.

Table 7.25 Survey Question: When was the last time you planted new trees?

	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Within the last two years	65.0%	82.5%	63.6%	35.0%	44.4%
Three to five years ago	15.4%	10.5%	22.7%	25.0%	11.1%
More than five years ago	19.7%	7.0%	13.6%	40.0%	44.4%

Note: Current growers only

Source: Authorôs Mid-Atlantic Apple Survey

Future Farm Investment Plans of Current Growers

In addition to past investments in their farms, growers were asked about their future plans for their farm. In the next five years, the majority of the current growers in the Fruit District are planning to maintain their apple acreage at their current level of operation (Table 7.26). While nearly one-quarter of Adams County growers plan to increase their apple acreage, Virginia led the other sub-regions with a paltry 6.3 percent expecting to increase their acreage. Close to one-quarter of Fruit District growers expect their apple acreage to decrease over the next five years. The Cumberland Valley and West Virginia sub-regions have the highest percentage of growers anticipating decreases in their apple acreage.

Table 7.26 Grower's Expectations of Apple Acreage Change on Their Farm over the Next Five Years

Apple Acreage Change, by farm	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Increase apple acreage	13.0%	23.2%	0%	4.5%	6.3%
Maintain present level of operations	63.5%	62.5%	61.9%	63.6%	68.8%
Decrease apple acreage	23.5%	14.3%	38.1%	31.8%	25.0%

Note: Current growers only

Source: Authorõs Mid-Atlantic Apple Survey

For some growers, a decrease in apple acreage may just be a natural scaling back of the farm workload as the grower ages (Boehlje 1973; Gale 1994; Source 1028 2010; Source 1082 2010). Other acreage decreases can be attributed to future plans to sell the farm or a few orchard parcels. On the other hand, some growers who are anticipating acreage declines are actually increasing, or at least maintaining, their apple production tonnage by intensifying production on fewer acres (Glaize 2010a; Kuhn 2010; Miller 2010; Wenk 2010). In the next five years, 42.2 percent of the Fruit District growers plan on increasing the densities of their apple plantings (Table 7.27). Over 55 percent of Adams County growers will be increasing their tree densities compared to less than 20 percent of West Virginia growers. Slightly more than 65 percent of Fruit District growers will be replanting acreage in the next five years. Once again, like the percentage who have replanted trees within the last two years, Adams County leads the Fruit District with the highest percentage of its growers expecting to replant trees in the next five years (Table 7.25; Table 7.27). Some Fruit District growers will also be making capital investments in their farm through the purchase of expensive farm machinery or new farm buildings. The percentages of growers making these types of capital investments over the next five years were relatively evenly distributed by sub-region with the exception of Virginia. Less than 7 percent of Virginia growers plan on making major farm infrastructure purchases.

Table 7.27 Survey Question: In the next five years, do you expect to make any of the following capital improvements?

Type of Capital Improvement	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Plant or replant apple acreage	65.5%	77.2%	61.9%	45.5%	56.3%
Increase the density of plantings (more trees per acre)	42.2%	56.1%	42.9%	18.2%	25.0%
Purchase expensive farm machinery	31.9%	42.1%	23.8%	31.8%	6.3%
Buy or construct farm-related buildings	24.1%	26.3%	28.6%	27.3%	6.3%

Note: Percentages will not add up to 100 percent. Growers were allowed to select more than one statement.
Note: Current growers only

Source: Authorôs Mid-Atlantic Apple Survey

Very few growers expect to sell their farms in the next five years (Table 7.28). At 14.3 percent, the Cumberland Valley had the highest percentage of growers that may sell out (Figure 7.7). While there are no growers that intend on selling their farm in the Virginia sub-region, some Virginia growers may sell some land parcels (Table 7.28). Once growers make the decision to sell their current orchards, it is usually a permanent decision to exit the apple industry (Bennett 2004). Over 80 percent of the Fruit District growers said that they were not likely to establish another apple orchard in a different location once they sold their current operation. Another 12.3 percent were unsure, while only 6.6 percent thought they would start a new orchard in a different locale. This differs

from the behavior of other farmers in the area. Farm Service and extension agents in Berkeley County (WV) and Washington County (MD) have noted that there has been a small migration of livestock and grain farmers that have sold their farms in the local area and have moved to the Midwest to purchase larger or mortgage-free farms (Bennett 2004; Semler 2010).

Around 10 percent of the Fruit Districtôs current growers expect to exit active farming but rent out their land for somebody else to farm (Table 7.28). Only around five percent of the growers in Adams County and the Cumberland Valley had this plan of action compared to nearly one-third of Virginia growers. Not included in this percentage were the five former growers from Virginia who were already renting their orchards out to current growers. Only 8.7 percent of current growers thought that they may switch away from fruit but still continue to farm within the next five years.

Table 7.28 Grower Plans in the Next Five Years

Options	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Sell your farm	6.1%	5.3%	14.3%	4.5%	0%
Sell some of your land	11.3%	5.3%	19.0%	13.6%	16.7%
Exit active farming but rent your land to another grower	10.4%	5.3%	4.8%	18.2%	32.2%
Stop growing apples but continue farming	8.7%	7.0%	14.3%	13.6%	0%
None of the above	71.3%	78.9%	61.9%	63.6%	66.7%

Note: Percentages will not add up to 100 percent. Growers were allowed to select more than one statement.
Note: Current growers only

Source: Authorôs Mid-Atlantic Apple Survey



Figure 7.7 Orchard Land For Sale

Orchard for sale in the North Mountain Fruit Belt west of Chambersburg; Franklin Co. PA
Photograph by Joseph P. Guttmann

While maybe not occurring in the next five years, over 50 percent of all growers said that they would at least consider shifting to another type of agriculture if they stopped growing fruit in the future or have already decreased their fruit acreage. Of those indicating a willingness to shift away from growing fruit to another form of agriculture, the highest percentages would consider or have already shifted to grains, hay or pasture, and vegetables. Lower percentages of growers would shift to beef cows or other crops such as grapes, berries, or Christmas trees. Only one grower would shift to dairy, a capital-intensive agricultural endeavor that historically has been most negatively affected by development pressures (Berry 1979; Lawrence 1988; Hart 1991; Sokolow 2003; Foltz 2004). Grains, hay, and beef cows all represent a de-intensification of inputs per acre while fewer growers would plant high-value vegetables, an intensive use of the land (Bryant and Johnston 1992; Blank 1998). Even berries can be less intensive than apples. One former part-time apple grower noted that he switched to pick-your-own blueberries because the berries take less of his time, need less outside labor, require smaller equipment, and earn higher returns per acre than apples (Source 3182 2010).

Rating the Importance of Factors Contributing to the Decision to Exit Apple-Growing

The decision to continue or exit apple-growing is based on the level of importance a grower attributes to factors at all three scales ï the macro, regional, and farmstead. First, growers rated the level of difficulty that certain issues were causing their business (Table 7.29). Two issues stand out as causing more difficulty to the growers than the other options. The importation of foreign apple juice concentrate and other apple products was rated as the most challenging issue followed by government regulations. Both are macro-scale issues. Other issues averaged less than the midpoint (a rating of 3) on the difficulty scale. Ranked third was the difficulty in obtaining grocery store space although many growers abstained from this question. The lowest scores were regional issues concerning labor and the ability to expand production in the face of rising land values. Most growers were content with the size of their acreage or were planning on scaling back in the next five years (Table 7.26). Geographically, Virginia growers noted more difficulty in obtaining labor, expanding acreage, and managing their farmôs debt load compared to the other sub-regions.

Table 7.29 Average Ratings of the Degree of Difficulty Growers have had Coping with the Challenges Facing the Fruit District

Issues	Overall	Adams County	Cumberland Valley	West Virginia	Virginia
Difficulties in obtaining labor	2.29	2.00	2.23	2.53	2.78
Inability to expand production through purchase or renting of land	2.17	2.34	1.80	1.89	2.53
Managing your debt load	2.43	2.34	2.28	2.39	2.87
Government regulations/red tape	3.74	3.82	4.08	3.31	3.74
Moving to high-density plantings	2.65	2.71	2.52	2.63	2.63
Difficulty obtaining grocery store shelf space	2.84	3.00	2.59	2.63	3.00
Foreign concentrate and other apple product imports	3.89	3.82	4.28	3.57	4.04

Note: Growers rated each issue on a scale of 1 to 5 with 1 = No Problem and a 5 = Extreme Difficulties Numbers above are averages.

Source: Authorôs Mid-Atlantic Apple Survey

Finally, growers rated the level of importance that various factors would likely contribute to a decision to stop growing apples (Table 7.30). By far the most important factors that contribute to a decision to stop growing apples are low apple prices and the rising costs of expenses. Government regulations/red tape ranks third and is the only other issue that averages over a 4 rating. I would be surprised if more than a few growers quit growing apples solely because of government regulations. However, together with low profit margins, some growers may conclude that growing apples is not worth the frustration caused by onerous government regulations. The only macro issue that did not score high was ñcompetition from other growers.ò While I had intended for the question to encompass all growers from all regions, I think most respondents interpreted the question as competition from other growers in the local area. After all, the respondents rated competition from foreign apple products as their most challenging issue (Table 7.29). I think that had the question been reworded to read ñcompetition from other foreign and domestic apple-growing regions,ò the importance of the role of competition in the decision to stop growing apples would have received a higher rating.

Table 7.30 Average Grower Ratings of the Level of Importance the Following Factors have on the Decision to Stop Growing Apples

Factors	Overall	Former Growers	Adams County	Cumberland Valley	West Virginia	Virginia
Low apple prices	4.51	4.91	4.35	4.59	4.53	4.78
Rising cost of expenses - fuel, pesticides, equipment	4.44	4.81	4.18	4.63	4.60	4.68
Ability to sell land for high price	2.96	2.67	2.93	3.00	2.83	3.14
Difficulties in obtaining labor at affordable rate	3.37	3.48	3.40	3.37	3.27	3.45
Government regulations/red tape	4.04	3.68	4.05	4.37	3.80	3.91
Other employment opportunities for you	2.17	3.05	1.98	2.40	2.10	2.55
Competition from other growers	1.95	1.71	1.93	2.00	1.86	2.05
Son/daughter not interested in farming	3.41	4.05	3.46	3.33	3.33	3.46
Retirement	3.27	3.89	2.98	3.33	3.66	3.46
Inability to expand farm through purchase or rental of land	2.22	2.35	2.53	2.04	1.75	2.24
Debt load or difficulties obtaining financing	2.63	3.05	2.61	2.27	2.90	2.71
Continue farming but switch to other crops	2.44	2.50	2.22	2.70	2.54	2.60

Note: Growers rated each issue on a scale of 1 to 5 with 1 = No Problem and a 5 = Extreme Difficulties
Numbers above are averages.

Source: Authorôs Mid-Atlantic Apple Survey

The ability to obtain labor scored much higher as a potential reason to leave apple-growing than it had as a challenge to farm operations (Table 7.28). For Adams County, the difference in ratings was 1.40. One explanation for the large difference in ratings between the two questions is that, currently, most growers are not experiencing difficulty in obtaining labor but that the availability of labor is an issue that many growers are worried about for the future viability of their farm operation. The addition of ñat an affordable rateò to the question in Table 7.29 may also have contributed to the difference in ratings between the two questions.

Other regional-scale factors did not rate as highly in importance as obtaining affordable labor. The ability to sell land for a high price scored right at the midpoint. It was important and not important for roughly an equal amount of growers. Like the result in Table 7.28, the inability to expand the farm through the purchase or rental of land scored low as a possible factor contributing to an exit from apple-growing. Likewise, the availability of other employment opportunities, which can be classified as both a regional and farm-level factor, also was rated low.

Not having a son or daughter that was interested in farming was rated as the most important factor at the individual farm-scale. Almost 32 percent of Fruit District growers rated the lack of a son or daughter taking over the farm as ñvery importantò in a decision to exit apple-growing (Table 7.30). Retirement was not far behind the lack of a farm successor in the ratings. Debt load or difficulties obtaining financing was very important for 18.5 percent of the growers but not important for 34.8 percent. More growers were likely to stop growing apples but continue farming than to switch careers.

For most current growers, rating the factors in a decision to stop growing apples was just a hypothetical exercise. On the other hand, for former growers, this question was a reflective exercise. Although it was a small sample size of around 20 responses, I found marked differences in some ratings between former growers and current growers in the Fruit District (Table 7.30). For example, former growers were more likely than current growers to cite other employment opportunities as an important factor in their decision to stop growing apples. Former growers also gave more weight in their ratings to retirement and the lack of a son or daughter being interested in farming. The higher ratings can be partially explained by the fact that 80 percent of former growers did not have a son, daughter, or other close associate taking over their farm upon retirement. One former grower said that when his only child went off to college to pursue a non-agricultural career, the decision to remove the orchard and put in houses became easier (Source 3170 2004). Managing their debt load and difficulties obtaining financing was also a more important factor for former growers. On the other hand, former growers gave less weight to the importance of government regulations and high land prices than current growers. The former growers were almost unanimous in their opinion that low apple prices and rising expenses were ñvery importantò factors in their decision to stop growing apples. When ranking their most important factor in the decision to stop growing apples, 40 percent of former growers chose the low annual rate of return on their investment, 40 percent selected retirement, 15 percent chose other employment opportunities, and five percent cited the difficulty in obtaining labor.

Key Findings for Chapter Seven

- The Virginia sub-region has larger, but fewer, apple operations when compared to Adams County (PA). Almost 30 percent of Virginia operations have at least 300 acres of apples. Growers in Virginia were less likely to have diversified their operations by planting other fruit.
- The growing of peaches is a common complementary activity for many growers in the Fruit District. Peaches offer higher potential returns but are a riskier crop to produce.
- Around 70 percent of the growers in Adams County and the Cumberland Valley sell some of their crop through packinghouses or other wholesale means compared to around 40 percent for the Virginias. Pennsylvania packinghouses accept a higher percentage of other growerôs fruit than packers in the Virginias.
- Many packinghouses are expanding capacity in anticipation of growers switching away from the processing market and growing more fruit for the fresh market.
- Nearly 75 percent of the Fruit Districtôs growers intentionally grow processing apples. Over 30 percent of the growers sell at least 90 percent of their crop to the processors.
- Growers can earn the highest returns by selling fruit through direct outlets but are limited by the volume of fruit that can be moved through these means. Many growers take advantage of the demand for local, fresh fruit by attending farmersô markets or by operating their own on-the-farm retail outlets. A number of Fruit

District growers market their fruit at the more distant, but more profitable, farmerôs markets of Washington, Baltimore, or their suburbs.

- Higher grower optimism about the future of apple-growing in their area was reported in Pennsylvania compared to the Virginias. The percentage of growers rating the importance of maintaining their lifestyle of living on a farm as ñvery importantò was low in the Virginia sub-region compared to the other sub-regions.
- Adams County has the highest number of growers expecting a child or other close associate to take over the farm upon their retirement. The emergence of the Young Growers Alliance has reenergized both the younger and older generation of growers in Adams County.
- Higher percentages of growers from Adams County have replanted trees within the past two years than in the Virginias. The higher percentage of growers that are switching to high-density, fresh market apple varieties in Adams County and lower grower morale in the Virginias partially explain the geographic differences.
- The majority of growers in the Fruit District plan on maintaining their present level of operations over the next five years.
- One-third of the growers in the Virginia sub-region plan on exiting apple-growing in the next five years but will lease out their land to other farmers. This plan of action will lead to the consolidation of more acreage being operated by fewer growers as well as some orchards being pushed out and not replaced.
- According to growers, the most challenging issues that their operations currently face are the importation of cheap foreign apple juice concentrate and government

regulations. Obtaining labor and the inability to expand production through the purchase or leasing of land were the lowest rated issues.

- More growers rated low apple prices and the rising cost of expenses as the most important factors in the decision to stop growing apples rather than the other listed options. Government regulations, children not interested in farming, obtaining labor at an affordable rate, and retirement also received higher than average ratings.
- Former growers rated other employment opportunities, retirement, the lack of a child successor, and long-term financial difficulties as more important factors in their decision to exit apple-growing than current growers.

CHAPTER 8: DISCUSSION

The final chapter revisits the questions posed at the beginning of the dissertation. Specifically, 1) what are the factors behind the 25-year decline in apple acreage in the Shenandoah-Cumberland Valley Fruit District; 2) why has the apple acreage of some areas of the Fruit District declined faster than others and 3) what management practices have remaining growers adopted to keep their operations viable? In addition, this chapter examines the future outlook for the Shenandoah-Cumberland Valley Fruit District.

What Factors are Behind the Fruit District's 25-year Decline in Apple Acreage?

Using geographer Christopher R. Bryantôs systems approach, this dissertation evaluated the macro, regional (meso), and farm-level (micro) factors that have contributed to the nearly 50 percent decline in the Shenandoah-Cumberland Valley Fruit Districtôs apple acreage over the past 25 years (Bryant 1984; Bryant and Johnston 1992). From 1982 to 1992, two-thirds of the apple acreage decline occurred in the Fruit Districtôs Appalachian Ridge and Valley province (Figure 6.7; Table 3.3 ï Hampshire (WV), Morgan (WV), and Washington (MD) counties). The development of better-colored apple strains that could be grown everywhere undercut the mountain orchardsô primary advantage in the marketplace. The low yields per acre produced on the cherty mountain soils could not compete against higher-yielding regions under the existing price and cost structure, especially as labor costs went up (Hart 1968; Berry 1978; Miller 1993c; Baugher 2010; Marini 2010). The resulting loss of apple acreage on the marginal land of the Appalachian Ridge and Valley province accounts for approximately one-

quarter of the total apple acreage decline in the Shenandoah-Cumberland Valley Fruit District over the past 25 years (Table 3.3).

Part of the more recent decline in apple acreage in the Shenandoah-Cumberland Valley Fruit District can be attributed to a larger national trend of apple acreage loss. The nationôs apple acreage has declined by almost 25 percent since 1999 (Table 5.6). With the exception of the Columbia Basin in Washington, all major apple-growing regions in the United States have lost acreage (Table 8.1). Extended years of low prices in the late 1990s to mid-2000s were caused by an oversupply of domestic apples, a slow down in the export market, and the mass importation of cheap, foreign apple juice concentrate. As part of a market correction, many less efficient orchards were pushed out. Some of these orchards were replanted with higher tree densities while other orchards were permanently removed (OôRourke 2001; Edwards 2004; Pollack and Perez 2005; Belrose Inc. 2006a; Lynch 2010). The lowering of the processing price floor caused by the flood of cheap, imported apple juice concentrate especially hurt regions like the Shenandoah-Cumberland Valley Fruit District that rely heavily on the processing market (Guise 2010; Harper 2010). Fruit District growers rated the importation of foreign concentrate and other apple products as the most difficult challenge that they have faced (Table 7.29).

Table 8.1 Apple Acreage Change in Major U.S. Apple Districts 1997-2007

Apple District	1997 Apple Acreage	2007 Apple Acreage	Change in Apple Acreage 1997-2007
Yakima Valley (WA)	93,689	65,103	-30.5%
Wenatchee (WA)	55,643	35,344	-36.5%
Columbia Basin (WA-OR)	55,221	64,886	17.5%
San Joaquin Valley (CA)	25,340	10,089	-60.2%
Western New York	35,036	30,568	-12.8%
Hudson Valley (NY)	14,568	9,951	-31.7%
Lake Michigan (MI)	59,045	36,913	-37.5%
Henderson County (NC)	7,285	5,660	-22.3%
Shenandoah-Cumberland Valley	47,451	29,059	-38.8%

Note: Apple Districts contain contiguous counties that had at least 1,000 acres in apples in 1982. Major plantings in the San Joaquin Valley occurred later so its baseline year is 1997. Contra Costa County (CA), which had 1,964 acres in 1997, is not included in any totals because of a non-disclosure issue in 2007.
Source: USDA NASS *Census of Agriculture*

Low apple prices and the rising cost of operational expenses were the factors rated by the most growers in the Fruit District as ñvery importantò in their decision to stop growing apples (Table 7.30). Some growers have noted that apple-growing does not really give a proper rate of return on their investment given the amount of risk that is involved in each yearôs crop (Edwards 2004; Source 3170 2004; Doyle 2005; Mangino 2006b; Glaize 2010b). Even if the weather was favorable and Fruit District growers produced a perfect crop, prices may still be low if Washington, Michigan, and/or New York have large crops that depress the market. For growers in Virginia, decisions to delay replanting of apple trees, remove unproductive orchard blocks, and exit apple-growing have been attributed to extended years of low prices and poor weather (Sokowloski 2002b; Edwards 2004; Withers 2005; Kane 2008; Mangino 2010b).

If the recent losses of apple acreage in the Fruit District were only attributable to low prices, then the acreage loss should be evenly spread throughout the sub-regions. The Fruit Districtôs apple acreage losses have not been spatially uniform. Since 1997, the West Virginia sub-region has lost 54.5 percent of its apple acreage, the Virginia sub-region has lost 42.4 percent, while Adams Countyôs apple acreage has only declined by 24.9 percent (Table 6.5). One factor that differentiates these sub-regions is the rate of population growth. In the past 10 years, the northern Shenandoah Valley counties ð Berkeley (WV), Jefferson (WV), Clarke (VA), Frederick (VA), and the independent city of Winchester (VA) ð have seen a combined population increase of 29.3 percent while Adams Countyôs (PA) population grew by 11.1 percent (US Census Bureau 2011).

This generalized pattern of a higher percentage of apple acreage loss occurring in areas of higher population growth also holds true among some of the other apple-growing districts in the eastern United States. For example, the district with the highest percentage of population growth, Henderson County (NC), has lost a higher percentage of its apple acreage than the Western New York Fruit District, an area experiencing meager population growth (Table 5.12). One explanation for this pattern is that rising land prices in the Shenandoah-Cumberland Valley Fruit District and Henderson County (NC) present growers with the opportunity of selling their farm for the value of the landôs development potential while growers living in areas with slow or negative population growth may not have these options (Source 3170 2004).

The question remains: is the loss of apple acreage in the Shenandoah-Cumberland Valley Fruit District a reflection of the impermanence syndrome? As

mentioned in Chapters One and Two, the impermanence syndrome suggests that there is an air of uncertainty about the future viability of farming in areas of rapid population growth and land-use change (Clawson 1962; Sinclair 1967; Lockeretz *et al.* 1987; Hart 1991; Bryant and Johnston 1992; Sokolow 2003). Studies have shown that farmers living in these areas will be less inclined to invest in major capital improvements if they are pessimistic about long-run prices, nearing retirement and lack a known successor, or expect to exit farming before the amortization of the new investments (Berry 1979; Pillsbury and Florin 1996; Zollinger and Krannich 2002; Bragg and Dalton 2004). Farmers in these areas may also switch to a less intensive, but more flexible, form of agriculture (Sinclair 1967; Bryant and Johnston 1992; Blank 1998). As more land is taken out of production, an areaôs agricultural support industries may close and farmers may experience a decline in local political power (Clawson 1962; Prunty and Aiken 1972; Berry 1978; Lapping 1980).

There is evidence supporting the impermanence syndrome hypothesis in the counties of the northern Shenandoah Valley ð Berkeley (WV), Jefferson (WV), Clarke (VA), Frederick (VA) ð but not necessarily the remainder of the Shenandoah-Cumberland Valley Fruit District. As a result of increased integration with the Washington D.C. metropolitan area and the internal growth around Winchester (VA) and Martinsburg (WV), 83.3 percent of the mail survey respondents from the counties of the northern Shenandoah Valley reported that the intensity of development pressures in their area has been ñhigh.ò Over 52 percent of these same growers were ñsomewhatò or ñveryò pessimistic about the continued future of apple-growing in their area. Around 56

percent thought that their land was not likely to stay in agriculture in the event that they would sell their farm and 42.5 percent have already sold some land parcels for non-agricultural uses. In addition, 58.5 percent of northern Shenandoah Valley growers do not expect a child or other close associate to take over the farm upon their retirement.

The negative future outlook by the growers in the northern Shenandoah Valley appears to be affecting their farm reinvestment choices. Nearly 63 percent of these growers have decreased their apple acreage over the past 15 years. Of the current northern Shenandoah Valley growers, 40.7 percent expect their apple acreage to continue to decrease in the next five years. A number of growers in Virginia have also been switching to less intensive agricultural pursuits such as growing corn and soybeans (Edwards 2004; Withers 2005; Beidel 2009; Kearns 2010). A relatively high 46.4 percent of northern Shenandoah Valley growers have waited more than five years to replant trees. A paltry 7 percent of growers in Frederick (VA) and Clarke (VA) counties will be purchasing expensive new equipment or farm buildings in the next five years. The lack of reinvestment eventually reduces the farmôs competiveness and ability to stay in business. Around 30 percent of growers in the northern Shenandoah Valley anticipate exiting apple-growing within the next five years.

Further evidence supporting the impermanence syndrome hypothesis is that some fruit industry support businesses have closed or shifted business strategies in the Virginias (Edwards 2004; Cox 2008; Vaden 2009). Several growers have noted that with fewer growers to support the businesses, prices for chemical sprays and other specialized orchard inputs have increased (Kearns 2010; Source 3199 2010). As the apple industry

loses growers and its relative importance to the areaôs economy wanes, the industry has lost local political clout in both West Virginia and Virginia (Kearns 2010; Miller 2010). One Virginia grower notes that local government seems sympathetic to the needs of the fruit industry, but not when it comes to using public dollars (Kearns 2010).

Only a couple of signs did not point to the existence of the impermanence syndrome in the northern Shenandoah Valley. With a score of three being the midpoint on a five-point Likert scale, the degree of difficulty that growers cited in expanding production through the purchase or leasing of land was rated a low 1.89. The inability to expand the farm was also not deemed to be an important reason in the decision to stop growing apples. The ability to sell land for a high price received a decidedly average score of 2.83. Surprisingly, almost one-third of the growers felt that the ability to sell their land for a lucrative price was ñnot importantò in their decision to exit or continue growing apples. One grower who has been approached multiple times to sell a parcel of his land always simply replies ñyou donôt have enough moneyò (Miller 2010).

Whether a grower is optimistic about the future and reinvests in his or her farm is often a function of factors at the global or regional scales. For example, a grower may not reinvest in his or her farm because of foreseeable low prices or high development pressures in the area. Some factors at the farmstead level, not related to global or regional factors, also may lead to a decline in apple acreage. For example, a grower could be having difficulty managing his or her debt. As some growers age, they may cut back on their apple acreage in order to lessen the work load (Boehlje 1973; Gale 1994; Hoppe and Korb 2006; Source 1082 2010). Other growers retire without a successor and

may lease their land out to a non-fruit-growing farmer. Many times the lack of a child wanting to take over the farm is not because the farm is not profitable, but because the child may have other career interests (Miller 2010). Family disputes among the heirs of a deceased grower has also idled some orchards (Semler 2010; Source 2210 2010).

Why Has the Apple Acreage in Some Areas of the Fruit District Declined Faster than Others?

This section compares two areas of the Fruit District that have experienced differing rates in apple acreage decline, Adams County (PA) and the northern counties of the Shenandoah Valley. Adams County (PA) is the sub-region of the Fruit District that has the highest concentration of orchards. Since 1997, apple acreage in Adams County has declined by 24.9 percent (Table 6.5). The northern counties of the Shenandoah Valley ð Berkeley (WV), Jefferson (WV), Frederick (VA) and Clarke (VA) ð present a good contrast with Adams County (PA). For comparison, the northern Shenandoah Valley counties have been grouped together because the other counties within the West Virginia and Virginia sub-regions are located outside of the Washington D.C. commuting zone. The counties of the northern Shenandoah Valley have been experiencing considerable development pressure and the areaôs apple acreage has declined by 50.1 percent since 1997 (Figure 6.2; Table 3.3). It is also an appropriate comparison because Frederick (VA) and Berkeley (WV) counties have historically had the second- and third-most apple acreage in the Fruit District after Adams County (PA) (Table 3.3).

From a personal observation, one of the immediate apparent differences between the areas is the higher amount of new development occurring near the orchard areas of

the northern Shenandoah Valley than in the South Mountain Fruit Belt of Adams County (PA). Since 2000, population in the northern Shenandoah Valley has risen by 29.3 percent compared to an 11.1 percent increase for Adams County. Up until the 2010 Census, Adams County (PA) always had a higher population than either Frederick County (VA) or Berkeley County (WV), but the positions have now reversed (Table 6.1). In 2000, 17.7 percent of the workers living in the counties of the northern Shenandoah Valley commuted to jobs in the Washington-Baltimore metropolitan area compared to 7.7 percent of the workers from Adams County (Table 6.3) (US Census Bureau 2003). While Martinsburg (WV) is about 10 minutes closer than Biglerville (PA) to the job centers of suburban Maryland, Berkeley Countyôs (WV) lack of zoning has also attracted more new housing than Adams County (PA) (Figure 6.1; Figure 6.2). In addition, Interstate 81 has a much higher traffic load and has attracted more industry to Berkeley (WV) and Frederick (VA) counties than the limited-access U.S Route 15 in Adams County (PA) (Source 1103 2010). The accessibility of the Washington D.C. commuting zone and Interstate 81 to many of the orchard areas of the northern Shenandoah Valley is reflected in the perceptions of the growers in this area (Figure 3.6; Figure 3.7). Results of my mail survey indicate that the growers in the northern Shenandoah Valley counties sense a higher degree of development pressure than the growers in Adams County (Table 8.2). A higher percentage of growers from the northern Shenandoah Valley do not think that their land would remain in agriculture if they sold their farm and more growers from the northern Shenandoah Valley have already sold land for non-agricultural uses.

Table 8.2 Differences Between Adams County and the Northern Shenandoah Valley, Part I

	Adams County	Northern Shenandoah Valley
Percentage of growers reporting high development pressures in their area	38.3%	83.3%
Percentage of growers who do not think that their land would stay in agriculture if sold	19.4%	56.1%
Percentage of growers who have sold land parcels for non-agricultural uses	14.8%	42.5%
Percentage of growers who sell 85 percent or more of their apple crop to the processors	27.9%	61.5%
Percentage of growers who produce apples and another fruit	73.3%	45.5%
Percentage of growers who do not utilize the fresh wholesale market	29.5%	64.1%
Percentage of growers who attend farmersô markets	29.0%	29.5%
Percentage of growers who have on-the-farm retail or a pick-your-own operation	25.8%	38.6%

Source: Authorôs Mid-Atlantic Apple Survey

Significant differences between the two areas exist in the percentages of apples sold through each market outlet. The growers of the northern Shenandoah Valley are oriented more exclusively towards the processing market and many do not utilize the fresh wholesale market at all (Table 8.2). Adams County growers, on the other hand, have a more diverse approach to their marketing with a majority of growers selling on the fresh wholesale market and to the processors. Adams County growers are also more likely to produce other fruit. There are an equal percentage of growers from each area that attend farmersômarkets but there are more growers in the northern Shenandoah Valley that have an on-the-farm retail outlet or pick-your-own operation (Table 8.2). The

northern Shenandoah Valley supports more on-the-farm retail operations because it is a larger geographic area and has a larger population than Adams County.

The northern Shenandoah Valleyôs heavy reliance on the processing market leaves the growers in a financially vulnerable position when processing prices are low. Many growers cut back on their acreage or exited apple-growing when processing prices were low for most of the 2000s (Edwards 2004; Source 3170 2004; Withers 2005; Mangino 2006b; Kane 2008). Of the *former* growers from the northern Shenandoah Valley who responded to the survey, two-thirds sold at least 99 percent of their apples to the processors. Growers in Adams County were able to weather the low processing prices better than those growers in the Virginias. As processing prices stagnated, fresh wholesale prices were rising, benefiting those who had diversified market outlets (Table 5.6). In addition, several people have mentioned that the Knouse Foods cooperative has historically paid a higher price for its apples to its members and long-time suppliers than the other major processors in the Fruit District (Guise 2010; Marini 2010; Rice 2010). Cooperative members are not just suppliers of raw commodities but also capture the profits of the processing stage in the form of annual patronage payments (Evans 1957; Guise 2010). Although there are some Knouse cooperative members who live in the northern Shenandoah Valley, the majority of Knouse cooperative members from the Fruit District live in Pennsylvania. The higher prices that Knouse Foods pays out to its members may have been just enough to keep more growers in Adams County in business during the periods of low processing prices.

Another advantage which helps explains the acreage loss differential is that, as a region, Adams County has been an innovator and early adopter of change. The growers of Adams County have been proactive in seeking ways to enhance the competitiveness and long-term viability of their farms. The grassroots Adams County Ag Innovations project has led to research on mobile orchard platforms, improved orchard layouts, and self-propelled robotic vehicles as potential means to increase labor efficiencies (*Fruit Grower News* 2006; Baugher 2010; Baugher *et al*. 2011a; Sparks 2012). A higher percentage of growers in Adams County already use trellises to support dwarf rootstocks and these growers also plan on further increasing their tree densities (Table 8.3). There are no programs akin to the Adams County Ag Innovations project taking place in the northern Shenandoah Valley. The Pennsylvania apple industry also funds horticultural research at Penn State at a level higher than the Virginia apple industry funds Virginia Tech (Marini 2010). In addition, the innovative Young Growers Alliance was started in Adams County as a way to support the next generation of fruit growers (*Fruit Grower News* 2007; Sparks 2012).

The innovation and changes that are occurring are reflected in a more optimistic outlook among the growers concerning the future of apple-growing in Adams County (Table 8.3). Only a slim majority of Adams County growers are optimistic about the future. But years of low prices combined with a generalized impermanence syndrome have left the majority of growers in the northern Shenandoah Valley feeling pessimistic about the future of apple-growing in their region. The attitudes of the growers affect reinvestment choices and ultimately helps explain some of the geographic disparities in

apple acreage loss. For example, a much higher percentage of growers in Adams County have replanted trees within the past two years and some growers are anticipating increasing their apple acreage in the next five years. Conversely, a majority of growers in the northern Shenandoah Valley have decreased their apple operations over the past 15 years; only 25 percent expect a child or other close associate to take over the farm upon their retirement; and a higher percentage are expecting to stop growing apples in the next five years (Table 8.3).

Table 8.3 Differences between Adams County and the Northern Shenandoah Valley, Part II

	Adams County	Northern Shenandoah Valley
Percentage of growers who use trellis supports in their orchards	41.7%	27.5%
Percentage of growers who plan on increasing the number of trees per acre over the next 5 years	56.1%	18.5%
Percentage of growers who are optimistic about the future of apple-growing in their area	51.7%	26.2%
Percentage of growers who are pessimistic about the future of apple-growing in their area	23.3%	52.4%
Percentage of current growers who have replanted apple trees within the past two years	82.5%	32.1%
Percentage of current growers who plan on increasing their apple acreage over the next 5 years	23.2%	3.7%
Percentage of growers who have decreased their apple operations over the past 15 years	18.0%	62.5%
Percentage of growers who expect a child or other close associate to take over the farm upon their retirement	61.3%	24.4%
Percentage of current growers who expect to exit apple-growing within the next 5 years	12.7%	26.9%

Source: Authorôs Mid-Atlantic Apple Survey

What Management Practices Have Remaining Growers Adopted to Keep Their Operations Viable?

Having experienced a cost-price squeeze resulting from the overall fiscal troubles in the apple industry, many growers have tried to increase their revenues by changing their orchard management practices and market outlets. The lowering or stagnation of processing prices in the face of rising costs has affected most of the growers in the Shenandoah-Cumberland Valley Fruit District because of the Fruit Districtôs heavy reliance on the processing market. After all, three-quarters of the Fruit Districtôs growers intentionally grow apples for the processing market and 35.6 percent sell at least 85 percent of their apple crop to the processors (Table 7.13).

Given a choice, many growers would probably be happy to continue to just produce processing fruit if they could make money. With the stagnation in prices, however, around 45 percent of Fruit District growers have decreased the percentage of their apple crop being sold for processing and that trend will continue for the next five years (Table 7.14). These growers are trying to place a higher percentage of their fruit in fresh market outlets. Some feel that other growers in their area are not reinvesting in their farms and are not making the transition away from being primarily processing growers fast enough (Baugher 2010; Marini 2010; Wenk 2010). These processing growers ñare going to be running out of granddadôs money pretty soonò says Adams County grower Ben Wenk, referring to the decline in equity in some farms that had been built up over the generations (Wenk 2010).

There are a number of reasons why some growers have been slow to de-emphasize processing apples. Some processing growers may be in a later life stage and

do not have a child who has a long-term interest in farming. Wenk counters that if these growers were willing to try something new, such as growing fresh market apples, berries, or vegetables for a farmersô market, then their son or daughter may have a renewed interest in the farm (Wenk 2010). Other processing growers may not have the capital to switch to fresh market apples planted at higher tree densities (Belrose 2006a). There are also a number of growers who just have no interest in growing fresh market apples (Source 3170 2004; Kearns 2010; Source 4128 2010). Even among those who continue to grow primarily for the processing market, there has been more emphasis on growing ñpeelerò apples because the processors are buying less juice apples. For example, juice apples went from being around 50 percent of Knouse Foodôs raw apple purchases in the 1980s to less than 5 percent today (Guise 2010). The loss of the market for juice apples and ñdroppedò apples is a reason why there are more signs along the roadside advertising ñdeerò apples for sale.

Of the growers who have made orchard management changes, many have been increasing their average yield per acre, thereby lowering per unit costs. Average tree densities per acre in the Fruit District have been increasing over the years (USDA NASS 2004, 2005). Growers have also been switching to apple varieties that have a higher demand on the fresh wholesale market. For example, the top five varieties planted in Pennsylvania from 2006-2008 were primarily fresh market varieties. Pennsylvaniaôs two leading varieties by acreage, the dual-purpose Golden Delicious and processing York Imperial, were the sixth- and seventh-most planted variety during that same time span (USDA NASS 2008).

In addition to growing more apples for the fresh wholesale market, many Fruit District growers have improved their rate of return on their fruit by increasing their emphasis on farm stand or farmersô market sales. In Berkeley County (WV) for example, three farms have recently made major expansions to their on-the-farm retail facilities. More growers are also utilizing local and metropolitan farmersô markets to sell their fruit. As one farmer said ñFarmersô markets make it possible to maintain our property as farmland. It's not so much that developers would have forced us to sell out. Developers don't force anyone to do anything. It's that we would have had to earn income otherwise to pay the mortgage" (Weinraub 2005). Other methods that Fruit District growers have utilized to add value to their apples include growing heirloom and organic apples, and making apple butter, applesauce, apple cider, hard apple cider, ice cream, and bakery products.

Future Outlook of the Fruit District

Future Threats

The greatest potential threats to the continued viability of the apple industry in the Shenandoah-Cumberland Valley Fruit District include labor scarcities, competition from China, a virulent pest or disease outbreak, and continued residential and commercial development. While the majority of growers responding to my mail survey indicated that they were not currently having difficulties in obtaining labor, they were concerned about the impact a future scarcity of labor would have on their decision to stay in the apple business (Table 6.12; Table 7.30). Because the majority of harvest workers are foreign-born, the future availability of labor is linked to the politically contentious, national

immigration debate. An effort to provide amnesty for illegal aliens already working in the United States is unpopular with many conservatives and the H-2A guest worker program is unpopular with progressives (Foster 2009; Idlebrook 2010).

Several future scenarios concerning immigration could play out. Ideally for the growers, Congress would pass a version of the Agricultural Job Opportunities, Benefits, and Security Act (AgJobs). This act provides a pathway for permanent residency status for experienced farm workers who entered the country illegally, provided that the person continues to work in agriculture for a given number of years. The Act also would streamline the H-2A application process and lower the costs of using the program for the growers (Immigration Policy Center 2008; Foster 2009; US Apple Association 2012a). Passage of AgJobs would guarantee the supply of foreign-born labor at wage rates favorable to growers.

In contrast to the passage of the AgJobs legislation, an enforcement-only approach to immigration management, combined with further restrictions on the H-2A visa program, would be detrimental to the interests of growers (Glaize 2010b). Growers are especially worried about the mandatory institution of an E-Verify system. An E-Verify system would confirm the legality of a workerôs social security number at the time of employment, instead of several months after the apples are already picked (Harper 2010; Hollabaugh 2012; US Apple Association 2012a). Increased border security, E-Verify, and various state-level enforcement actions would all limit the supply of labor willing to pick apples at the current wage rates. If the current supply of harvest labor is curtailed, the question then becomes ñhow much would wage rates have to rise to

guarantee enough legal workers for the entire harvest season?ò Given the competition from other food options, consumers may not be willing to pay dramatically higher prices for apples. Because growers are price takers on the market, whether they can afford new cost inputs is determined by the prices received for their apples (Belrose Inc. 2010c). If the wage rate at which enough labor could be secured is not economically feasible for the grower, then the potential exists for widespread exits of farm operations from apple production. On the other hand, it is also possible that after an initial price shock, the apple industry and consumers would adjust to the new paradigm of higher wage scales and higher retail apple prices.

A third option is that the labor situation will maintain the current status quo. Growers will continue to hire workers with fraudulent documents, while also facing annual and long-term labor uncertainties (Schrecongost 1999; Berg 2003; Harper 2010; Idlebrook 2010; US Apple Association). While the current labor situation is far from ideal, the bottom-line is that the apples are getting picked. Personally, I feel that the current situation will muddle along for the foreseeable future because I do not think there will be a political settlement any time soon. While AgJobs does have bipartisan Congressional support, there is enough intraparty dissension to prevent its passage (Foster 2009; Idlebrook 2010; US Apple Association 2012a). Business interests and the courting of the Hispanic vote will also likely mean that the crackdown on improperly documented migrants will not be as effective as possible. For Fruit District growers, the most important challenge will be the tightening of the labor market as the economy recovers and the construction industry rebounds (Glaize 2010a; Kearns 2010). As for the

near future, once labor-saving new technologies have proven to be cost effective, the adoption rates of these new advancements compared to other apple-growing districts will be critical in determining the long-term competitiveness of the Shenandoah-Cumberland Valley Fruit District.

Labor-saving new technologies may also be needed to fend off a competitive challenge by China. The largest apple producer in the world benefits from low labor costs to create a price advantage in the market (Huang and Hale 2006; Guise 2010). One indirect threat to Fruit District growers is if China can continue to displace U.S apple exports to South and Southeast Asia (Schotzko 2004; Deodhar *et al*. 2006; Huang and Gale 2006; Lucier *et al*. 2006). The displaced exported apples, primarily from the state of Washington, would then need to find an alternative export market or be sold domestically. Increasing the supply of apples on the U.S. domestic market would impact Fruit District growers by lowering the prices for all apples. Fruit District growers would also be affected if China gained access to the United Stateôs fresh wholesale market. Chinaôs specialty, the Fuji apple, would not only be competitive with U.S.-grown Fuji apples but could potentially lower the price floor for all apples (Lynch 2010; Rice 2010).

U.S. growers may be able to nullify Chinaôs price advantage if orchard tasks can be mechanized. Countries like China that rely on low labor costs as their main market advantage would then have a difficult time following the United States lead because of the capital costs required to mechanize (Guise 2010; Source 1103 2010). Another factor that could nullify Chinaôs current advantage would be an adverse change in monetary exchange rates that would increase the price of Chinese apples in the importing country.

In addition, China has relatively high marketing costs because of a lack of efficiency in its fresh market wholesale supply chain (Warner 2005a; Huang and Hale 2006; Belrose Inc. 2010c; Leung 2011). However, if China eventually produces a higher quality apple, modernizes its orchards, and increases the efficiencies in its supply chain, the U.S. apple industry could be in for a turbulent period brought on by low wholesale prices.

Chinaôs greatest potential threat to the Shenandoah-Cumberland Valley Fruit District is the mass importation of applesauce and canned apple slices, the main products of the Fruit Districtôs processing industry. Long-term lower prices and a lowered demand for locally grown peeler apples would be devastating for Fruit District growers because canned apples are the products that now allow processing growers to remain profitable. Growers were previously able to survive the importation of cheap Chinese apple juice concentrate because the canned category remained a viable, albeit price-battered, market outlet. No alternative markets that require large quantities of processing-quality apples currently exist if the local apples used for applesauce are no longer economically viable. Because many processing apples are not suitable for the fresh wholesale market, the Fruit District would witness the large-scale removal of its processing orchards. Growers and sub-regions such as Virginia that devote a higher percentage of apples to the processing market would be more adversely affected by the importation of Chinese applesauce than growers that use multiple market outlets.

The importation of Chinese applesauce may not be a death knell to the Fruit Districtôs processors if the products are imported in bulk quantities and canned in the United States. If Chinese applesauce and apple slices offer a significant cost advantage,

it is possible that the processors would use the Chinese products as a stand-alone ingredient or for blending purposes with local apples. On the other hand, the applesauce industry would likely experience increased competition from new entrants into the market. Like the situation with foreign apple juice concentrate, the importation of inexpensive, bulk-shipped applesauce would allow other companies to can applesauce without first needing to transform raw apples into the finished product.

Ironically, an unintentional import from China, the brown marmorated stink bug, highlights the potential threat caused by the introduction of virulent pests and diseases to the Fruit District. Stink bugs damage fruit by leaving behind internal brown corking after feeding on the fruit (Figure 8.1). The affected fruit is then unsellable on the fresh market and unusable for apple slices (Lehnert 2011c, 2011d). The brown marmorated stink bug made its first documented appearance in Washington County (MD) in 2003 but did not become a noticeable menace to growers until 2008 (Leskey 2011; Warner 2012b). By 2009, one West Virginia grower reported having to divert over 40,000 bushels of apples (approximately 40 semi-trailer truckloads) from the fresh wholesale market to apple juice because of stink bug injury (Orrs 2010). The 2010 season witnessed record numbers of brown marmorated stink bugs and the infestation spread beyond the core Maryland and West Virginia counties in the Fruit District (Lehnert 2011d; Leskey 2011; Smoot 2011). Because the alien stink bugs overwinter in houses, I was actually more aware of the brown marmorated stink bug than the young growers from Adams County (PA) touring the USDA Appalachian Fruit Research Station in June 2010. By August 2010, however, growers in Adams County (PA) were reporting damage and an emergency educational

meeting for growers was held at the Peach Open House in Biglerville (PA). Stink bug damage to the apple crop during the 2010 season in West Virginia, Maryland, Pennsylvania, and Virginia amounted to $37 million and an 18 percent aggregate crop loss (U.S Apple Association 2011). For growers in the core counties of the infestation, orchard blocks with 50 percent or more of the apples having stink bug injury were not uncommon (Lehnert 2011d; Leskey 2011; Stellhorn 2011).



Figure 8.1 Brown Marmorated Stink Bug Injury

Left ï Brown Marmorated Stink Bugs cause small indentations and slight discoloration on the outside of the apple *Right* - Internal corking

Left Photograph from USDA-ARS Right Photograph by Christopher Bergh

Several attributes make the brown marmorated stink bug a pest capable of threatening the future viability of the Fruit District. Unlike certain pests that rely on one or two plant hosts for survival, the brown marmorated stink bug has been found to utilize over 300 plant species hosts. In addition to apples, brown marmorated stink bugs feed on peaches, cherries, grapes, berries, corn, soybeans, tomatoes, peppers and other vegetables, ornamentals, and wild vegetation (Leskey 2011; Smoot 2011; Warner 2012b). For farmers with a diverse product portfolio, this means that almost all of their crops have some vulnerability to the voracious eater. The bugs are very mobile and frequently move from host-to-host. Unlike native stink bugs, both nymphs and adult brown marmorated stink bugs feed on fruit. The risk period runs from May to October with two generations being born each season (Leskey 2011; Smoot 2011). The brown marmorated stink bug does not have any natural biological controls in the United States. The bugs are also not easily killed with pesticides. The bugs generally require direct contact with powerful pesticides and even then the stink bugs may go in a coma-like state and eventually recover. With pesticides providing little residual protection, new stink bugs soon replace those killed from spraying (Lehnert 2011c; 2011d; Smoot 2011; Warner 2012b). The increased frequency of spraying required to control the problem significantly raises a growerôs annual spray bill. One West Virginia grower noted that he had to spend $30,000 more on spray for his processing apples and his orchards still experienced significant fruit injury (Source 3226 2010). Another problem for growers is that the most effective pesticides have limits as to when and how much can be used in a single season. The use of more powerful pesticides also threatens the integrity of Integrated Pest

Management systems by killing beneficial insects too (Hull and Krawczyk 2011; Lehnert 2011c; 2011d; Warner 2012b).

The level of fruit injury and increased chemical costs incurred during the 2010 season are clearly not economically sustainable for growers in the long-term (Lehnert 2011d). Fortunately, brown marmorated stink bug numbers were down in 2011. Crop losses in West Virginia orchards were limited to 5 ï 15 percent compared to 25 ï 75 percent in 2010 (Stellhorn 2011). It is still too early to know how long it will take for researchers to develop an affordable, effective response that limits stink bug injury to fruit. If the level of stink bug injury returns to 2010 levels, or worse, it is then conceivable that some growers may exit the apple industry. Like the boll weevil in the southern Piedmont or the yellow dwarf blight in Pleasant Valley, Iowa, the Fruit District growers most susceptible to exiting agriculture also most likely have other underlying reasons for leaving the business that are only compounded and magnified by the stink bug infestation (Raper and Reid 1941; Aiken 1998; Bell and Gripshover 2002). Such underlying reasons may include low grower morale, not having children who will take over the farm, or already being in an economically precarious position. For a grower who is already considering exiting agriculture, the added expenses and headaches caused by the invasive species may be the last straw needed to make that decision.

While I am worried about areas of the Fruit District where these negative traits are more prevalent, growers in Adams County (PA) have proven to have been able to weather an outbreak of the plum pox virus. To curtail the spread of the virus, over one-half of the countyôs stone-fruit acreage was removed. The growers were compensated for

their tree removals but, unlike the brown marmorated stink bug, their other income-generating crops such as apples were not affected by the virus (*Fruit Grower News* 2008; Harper 2010; Lehnert 2012a). The effective elimination of plum pox from the county demonstrates the cooperation between the growers and federal and state government agencies necessary to overcome the problem. In the end, how the agricultural community responds to the current brown marmorated stink bug crisis and to future severe pest and disease disturbances that will inevitably occur will determine whether the Fruit District remains economically viable or succumbs to the threat like portions of the southern cotton kingdom did to the boll weevil.

A renewed vibrancy in the housing market poses the final threat to the Fruit District. In the mid-2000s, every time I went home to visit my parents in Berkeley County (WV) it seemed that another apple orchard was in the process of being pushed out to be replaced by a housing development. The removal of orchards and the pace of building were drastically curtailed by the economic recession of the late 2000s (Figure 6.2). When the business cycle changes course and property values rebound, I expect that orchard land will again be subject to conversion. In addition to a rebound in the real estate market, the rate of orchard conversions will depend on the apple price and profit margins. The high number of orchard conversions in the mid-2000s was driven by the conflation of the housing boom with a period of low apple prices (Table 5.6). Growers may still sell their land to developers if the price is right, but if apple prices can maintain their recent momentum with only occasional down years, then I would expect a more gradual pace of orchard conversions than was the case in the mid-2000s.

Development pressures will still be greatest in the areas of highest population growth. While it is true that different land parcels have different development potential, as the building of housing on former orchard land in rural areas of Hampshire (WV) and Franklin (PA) counties attests, most orchard land has the potential for conversion. In addition, as the city of Frederick (MD) becomes more of a job center, the growers of Adams County (PA) will feel more development pressure as commuters seek homes in the South Mountain Fruit Beltôs bucolic setting. Even if land conversions come at a slower pace than in the mid-2000s, the loss of orchard production will negatively affect the apple industry support businesses that require a critical mass of business to remain economically viable.

Future of the Marketing Outlets

The future of the fresh wholesale, processing, and direct-to-consumer markets offers a mix of promise and concern. For the packing industry, I expect a period of continued growth as more Fruit District growers continue to make the switch to producing a higher percentage of their apples for the fresh wholesale market (Table 7.14). The growth is fueled by several trends that benefit the eastern apple industry in its competition with Washington packinghouses. First, the buy local marketing surge shows no sign of abating. Apples grown in the Shenandoah-Cumberland Valley Fruit District are marketed as the local apples for a highly populated region that includes Washington D.C., Baltimore, Philadelphia, and the smaller cities of central Pennsylvania. As fuel costs remain elevated, the proximity to the major eastern markets also enable Fruit

District packinghouses to have an advantage in freight costs compared to the apples from Washington that must be trucked 3,000 miles cross-country (*Fruit Grower News* 2005; Marini 2010; Rice 2010; Wenk 2010). Finally, the public acceptance of bi-colored apples such as the Gala, Fuji, and Honeycrisp has broken the hegemony of the Red Delicious, a variety more suited to the dry Washington State climate. For years, Fruit District growers had been trying to compete against Washington growers who could produce more attractive, highly colored, and distinctly-shaped Red Delicious apples. The rise of the new varieties and decline of the Red Delicious has aided Fruit District packers in gaining increased access to the higher-value bulk bin supermarket displays (Higgins 2005; Marini 2010; Rice 2010; Lehnert 2012c).

On the other hand, even the largest Fruit District packinghouses will remain much smaller in size than many of Washingtonôs operations. The Washington packersô size advantage ensures that they will continue to dominate grocery store bulk bin displays because that stateôs packers have the ability to handle the large orders of grades and varieties required by national retail chains (OôRourke 1994; Gomez *et al*. 2010; Lynch 2010; Marini 2010; Rice 2010). Another potential threat comes from New York, a state that produces nearly three times more fresh apples than the Shenandoah-Cumberland Valley Fruit District. While the state already has several large sales networks that source apples from various packinghouses, the consolidation of New Yorkôs small and medium-sized packinghouses would help lower per unit packing costs (NYAS 2011). Lower per unit costs and low freight costs would increase the competitive pressure on Fruit District

packinghouses from a state that is already considered one of the Fruit Districtôs prime rivals.

As packinghouse technologies evolve, the survival of the smaller packers in the Fruit District will depend on their ability to reinvest in the equipment that is being demanded by the retailers (Marini 2010; Rice 2010; Source 1103 2010). I expect more consolidation to occur among packinghouses because I do not think that some of the smaller packinghouses will have the volume of fruit to justify the expense of some of the new technologies such as infrared sorters. Personally, I feel that the northern Shenandoah Valley would benefit from the emergence of one large packinghouse that would serve Frederick (VA), Berkeley (WV), and the adjacent counties. By packing other growersô fruit as well as peaches, the packinghouse would have the volume to stay technologically up-to-date and its presence would encourage the planting of even more fresh market apples in that section of the Fruit District.

In a quest to obtain higher returns than the wholesale market can provide, more growers have been gravitating to the direct-to-consumer market in recent years. Opportunities to increase direct-to-consumer sales still exist as the Fruit District has not reached its potential in this category. For example, Adams County grower Sidney Kuhn thinks that the demand for local, farmer-grown fruit at the farmers marketsô in the Washington-Baltimore metropolitan area currently exceeds the amount being supplied by the growers (Kuhn 2010). The catch is that to supply these lucrative markets, growers must be willing to commute one-to-two hours each way and interact with customers. Not all growers are willing make this time commitment.

I feel the potential for increased on-the-farm retail sales also exists. Some areas of the Fruit District such as Jefferson County (WV) and Clarke County (VA) or sites along major highways that can lure in local customers and travelers are underserved and could support another fruit stand without saturating the market. Other areas have on-the-farm retail but the growers could further develop their retail presence by improving their storefronts or by adding agritourist activities (Martin and Martin 2010; Semler 2010). For example, Washington County (MD) has six grower-run fruit stands but only one has pick-your-own fruit and none offers other agritourist activities such as hayrides and petting zoos. Another Washington County grower offers pick-your-own apples, but does not have a retail stand. Even in Adams County (PA), few orchards with on-the-farm retail markets offer pick-your-own opportunities or other agritourist activities.

Fruit District on-the-farm retail markets hoping to attract customers from the Washington-Baltimore metropolitan area are competing against several apple orchards in Maryland that offer agritourist activities and are nearer to the major cities. For example, one apple orchard located halfway between Baltimore (MD) and Gettysburg (PA) has an on-the-farm retail market, 200 acres available for pick-your-own fruit, hayrides, a bakery, a childrenôs playground, a petting zoo with exotic and farm animals, and offers group tours. The orchard also has another fruit market and restaurant in a nearby town (Baugherôs Farm 2012). No Adams County (PA) orchard offers that many agritourist options for families seeking to spend a day on the farm. On-the-farm retailers in Adams County (PA) do not necessarily have to offer the full array of agritourist options because the orchards are close enough together that families can visit several orchards in one day.

I think the Adams County (PA) on-the-farm retailers do, however, need to offer more overall entertainment options than are currently available as a lure to some of the Gettysburg tourist traffic.

On-the-farm retailers in Adams County (PA) would also benefit from signage on the southern and eastern approaches to Gettysburg alerting tourists to the presence of the nearby orchard area. Currently, the only farm market in Adams County that is located on US Route 15 is near York Springs in the northern section of the county. An opportunity for a grower from a more isolated locale of the county would be to open up a farm market along one of the southern approaches to the battlefield. Another suggestion for an entrepreneur would be to open an apple-themed restaurant in Gettysburg. In addition to more promotional signage in general, an apple-themed restaurant that became popular with tourists would help build public awareness of Adams Countyôs apples. More public awareness would also assist in any future branding efforts attempting to create place-based value for Adams County or Pennsylvania apples on the wholesale market.

Despite more Fruit District growers transitioning a higher percentage of their apple crop to the fresh wholesale and direct-to-consumer markets, the majority of apples grown in the foreseeable future will still be processed. Processing blocks will remain an important contributor to a growerôs overall farm portfolio. Since processing blocks require less initial investment and require less intensive care, processing apples can be an attractive addition for a grower with lots of land who is taking a diversified market approach. On the other hand, I think the long-term outlook for those specializing in processing apples is hazy, especially if prices were to return to the doldrums of the late

1990s to mid-2000s. Growers can still make money producing processing apples if the operation is well-managed and costs are kept to a minimum (Guise 2010). But the small profit margins often require a large-acreage, economies of scale approach or having an advantage such as a small debt burden. Other processing growers have found it necessary to have another income stream from off-the-farm employment or from other investments. Unless the orchard has low fixed costs, such as a land mortgage or orchard establishment costs that are already paid off, smaller acreage, processing-only orchards will have a difficult time surviving. If, on the other hand, processing prices rebound and can keep pace with inflation and the rising costs of inputs, then the impetus for switching to other market outlets will diminish.

While apple processing may not be in a robust growth phase, there has been slow, steady growth in the market and the major processors of the Shenandoah-Cumberland Valley Fruit District are making money (Glaize 2010a; Guise 2010). A shake-up in the sector occurred when Mottôs ended apple processing at its Aspers (PA) facility in 2007. At first, Mottôs continued to purchase apples from Fruit District growers for processing in New York. It now appears that the company is trying to curtail its Mid-Atlantic apple purchases, but itt remains to be seen if the company will go through with this strategy (Harper 2010; Molenda 2012). If Mottôs does pull its purchases, I would assume that the other area processors would buy the apples produced by Mottôs former suppliers. I would be shocked if the departure of Mottôs from the area would directly lead to any grower exiting apple-growing.

The remaining home-grown processing companies look stable, at least for the time being. While the grower members of the Knouse Foods cooperative could always sell the company for a profit, the probability of that occurring is very low. Selling the production facilities would reduce the growers to being suppliers only, instead of owner-suppliers (Guise 2010). In Virginia, the 3,472 acre Fruit Hill Orchards is National Fruitôs main supplier of raw fruit (Table 7.9). If one of those two companies should falter, then the other company would experience major difficulties (Beidel 2009; Kearns 2010; Kitchen and Boarman 2010; Marini 2010). Bowman Apple has restructured from a family-owned vertically integrated operation to an employee-owned operation, but the Bowman family still plays the prominent role in the company (BAP 2011). If National Fruit, a family-owned business, or Bowman Apple were ever sold to an out-of-area business conglomerate or private equity group, then the processing companiesô future could be in doubt. It is conceivable, for example, that a large food conglomerate could buy National Fruit, keep the White House label, close the Winchester (VA) factory, and move production elsewhere. If any of the three processors closed, then I think the disruption to the overall health of the Fruit District will be much greater than the withdrawal and closure of the Mottôs facility.

Final Thoughts on the Future of the Shenandoah-Cumberland Valley Fruit District

Overall, despite the loss of nearly one-half of its apple acreage and the continued growth and development in the area, I am mildly optimistic about the future of the Shenandoah-Cumberland Valley Fruit District. The decline in apple acreage has not been matched by an equal decline in total apple production (Table 3.4). Many growers are

making the necessary adjustments to remain economically viable. These growers are increasing tree densities and diversifying their market portfolio to include more fresh market wholesale and direct sales. Fruit District packers are taking advantage of the buy local movement through labeling and newer fresh market varieties have helped level the playing field a bit with Washington apples. Growers have also started to take more advantage of their proximity to the large wealthy, population centers of the Washington-Baltimore metropolitan area by selling fruit at metropolitan farmersô markets while attracting local and out-of-town customers to their own on-the-farm retail establishments.

I am most confident about the future of apple-growing in Adams County (PA). Compared to growers in the other sub-regions, Adams County grower morale is higher, development pressure is a little less intense, and the majority of growers expect their child or another close associate to take over the farm upon retirement (Table 6.4; Table 7.20; Table 7.22). Adams County growers are reinvesting in their farms by planting new trees at higher densities (Table 7.25; Table 7.27) (USDA NASS 2008). The Adams County Ag Innovations program is a proactive measure initiated at the grassroots level to promote progressive growing techniques, marketing, and land-use policies to improve the rural economy while the Young Growers Association is cultivating the next generation of fruit growers (*Fruit Growers News* 2006; Ellis 2009; Baugher 2010). Adams County has many growers in proximity to each other which fosters cohesiveness and a positive outlook among the growers (Marini 2010).

My optimism is more guarded for the rest of the Fruit District. These areas have faced and will continue to face development pressure, especially along the Interstate 81

corridor and the counties nearest to Washington D.C. Other than the Appalachian Ridge and Valley province, the areas with the largest declines in apple acreage have been the areas with the most intense development pressures. Other causes for concern are that growers in the northern Shenandoah Valley have expressed more pessimism about the future of agriculture in the area, have replanted at a slower rate than other areas, and many lack successors to their farm (Table 8.3). Evidence supporting the existence of the impermanence syndrome suggests that the apple industry in these areas will continue to downsize. But even in areas facing high development pressures, highly productive orchards with diversified market outlets should be able to survive and flourish. Barring the threats that are potential game changers ð labor scarcities, competition from China in the canned apple category, and an uncontrollable disease or pest outbreak ð the Shenandoah-Cumberland Valley Fruit District may continue to downsize, but the ability of growers to adopt their operations to changing circumstances ensures that there will still be an apple harvest to celebrate at the harvest festivals.

BIBLIOGRAPHY

Abram, Z. 2011. *Mid-Atlantic Young Growers Alliance Supports the Next Generation*. National Young Farmers' Coalition. Available from http://www.youngfarmers.org/blog/2011/03/28/mid-atlantic-young-growers-alliance-supports-the-next-generation/. Accessed May 1, 2012.

Adam, K. L. 2004. *Entertainment Farming and Agri-tourism: Business Management Guide*. National Sustainable Agriculture Information Service. Available from http://www.attra.org/attra-pub/entertainment.html. Accessed April 22, 2011.

Adelaja, A., and B. J. Schilling. 1999. Innovative Approaches to Farmland Preservation In *Contested Countryside: The Rural Urban Fringe in North America*, eds. O. J. Furuseth and M. B. Lapping, 113-135. Aldershot, UK.

Ahearn, M., J. Yee, E. Ball, and R. Nehring. 1998. *Agricultural Productivity in the United States, AIB-740*. Economic Research Service, United States Department of Agriculture.

Aiken, C. S. 1998. *The Cotton Plantation South: Since the Civil War*. Baltimore: The Johns Hopkins University Press.

American/Western Fruit Grower. 1991. 1991 Top Apple/Pear Growers. *American/Western Fruit Grower* 111 (8).

ð ð ð . 1996. 1996 Top Apple/Pear Growers. *American/Western Fruit Grower* 116 (8).

ð ð ð . 2007. *2007 Top Tree Fruit Growers*. Growing Produce. Available from http://www.growingproduce.com/recognition/topgrowers/topfruit/?storyid=718. Accessed August 20, 2011.

ð ð ð . 2012. *2012 Top 25 Apple/Pear Growers*. Growing Produce. Available from http://www.growingproduce.com/article/29064/2012-top-25-apple-pear-growers. Accessed July 23, 2012.

Andrews, M. 2009. *2008 Farm Bill Side-by-Side: Title IV Nutrition*. USDA Economic Research Service. Available from http://www.ers.usda.gov/FarmBill/2008/Titles/TitleIVNutrition.htm. Accessed January 10, 2011.

Audirac, I. 1999. Unsettled Views About the Fringe: Rural-Urban or Urban-Rural Frontiers. In *Contested Countryside: The Rural Urban Fringe in North America*, eds. O. J. Furuseth and M. B. Lapping. Aldershot, UK: Ashgate.

BAP. 2011. *Bowman Apple Products Co., Inc. Enters into a Joint Venture Agreement with Andros, European Leader in Fruit Products Production*. Bowman Apple Products. Available from http://www.bowmanappleproducts.com/news.pdf Accessed April 25, 2011.

Baugher, T. 2010. Personal Interview - Educator and Tree Fruit Specialist, Penn State Cooperative Extension, Adams County July 28.

Baugher, T., J. Schupp, J. Remcheck, K. Ellis, R. M. Crassweller, S. Singh, R. P. Marini, K. Lewis, and J. K. Harper. 2011a. Mobile Orchard Platforms. In *Specialty Crop Innovations Progress Report*, ed. T. Baugher: Penn State Fruit Research and Extension Center, Adams County.

Baugher, T., J. Schupp, E. Winzeler, and M. Bergerman. 2011b. Mechanically Assisted Harvest of Apples. Paper read at ASABE Annual International Meeting, at Louisville, KY.

Baugher's Farm. 2012. *Baugher's*. Baugher's Farm. Available from http://www.baughers.com/. Accessed July 18, 2012.

BCDA. 2012. *Major Employers and Industries of Martinsburg-Berkeley County, WV*. Berkeley County Development Authority. Available from http://06196e5a9319b41595238bae57b435f5a04a5ede.gripelements.com/pdfs/major_industries__employers_march_2011.pdf Accessed March 20, 2012.

Beesley, K. B. 1999. Agricultural Land Preservation in North America: A Review and Survey of Expert Opinion. In *Contested Countryside: The Rural Urban Fringe in North America*, eds. O. J. Furuseth and M. B. Lapping, 57-91. Aldershot, UK: Ashgate.

Behofist, C. 2012. *Backyard Adventure: Apples on Parade*. TV 3 Winchester Available from http://www.tv3winchester.com/home/headlines/Backyard_Adventure__Apples_on_Parade_142901515.html. Accessed July 10, 2012.

Beidel, E. 2009. Only One Orchard Survives Within City. *The Winchester Star*. Winchester, VA. March 29.

Bell, T. L., and M. M. Gripshover. 2002. Agricultural Evolution and Devolution: Growth and Decline of the Onion-Growing Complex in Eastern Iowa 1910-Present. Paper read at Annual Meeting of Association of American Geographers, March 2002, at Los Angeles.

Belrose Inc. 2006a. Great Unanswered Questions. *World Apple Report* 13 (6):1.

ð ð ð . 2006b. *World Apple Review*. 2006 ed. Pullman, WA: Belrose Inc.

ð ð ð . 2008a. Can Local Deliver? *World Apple Report* 15 (8):1.

ð ð ð . 2008b. Significant Changes in U.S. Markets. *World Apple Report* 15 (10):5.

ð ð ð . 2010a. *Frequently Asked Questions by Those in the Apple Industry*. Belrose Inc. Available from www.e-belrose.com/FrequentlyAskedQuestions.htm. Accessed March 24, 2010.

ð ð ð . 2010b. U.S. Organic Scorecard. *World Apple Report* 17 (5):7.

ð ð ð . 2010c. *World Apple Review*. 2010 ed. Pullman, WA: Belrose, Inc.

Bendfeldt, E. 2010. *Official Farm-to-School Week Established*. Delegate Ed Scott. Available from http://delegateedscott.com/2010/03/11/official-virginia-farm-to-school-week-established/ Accessed March 28, 2012.

Bennett, B. 2004. Personal Interview - Berkeley/Morgan County Farm Service Agency, April 23.

Bentley, A. 2010. *Big Apples Pose Challenges for Bags*. The Packer. Available from http://thepacker.com/Big-apples-pose-challenges-for-bags/Article.aspx?oid=972550&fid=PACKER-SPECIAL-SECTIONS&aid=351. Accessed May 15, 2011.

Berg, K. 2003. The American Apple: From Family Grown to Foreign Migrant Labor. Carlisle, PA: Dickinson College, http://www2.dickinson.edu/departments/commstud/PDF_files/studentpapers/BergMexMosaic03.pdf

Bernard, H. R. 1994. *Research Methods in Anthropology*. London: Sage.

Berry, B. J. L., E. C. Conkling, and D. M. Ray. 1993. *The Global Economy: Resource Use, Locational Choice, and International Trade*. Englewood Cliffs, NJ: Prentice Hall.

Berry, D. 1978. Effects of Urbanization on Agricultural Activities. *Growth and Change* 9:2-8.

ð ð ð . 1979. The Sensitivity of Dairying to Urbanization: A Study of Northeastern Illinois. *Professional Geographer* 31 (2):170-176.

Berube, A., A. Singer, J. H. Wilson, and W. H. Frey. 2006. Finding Exurbia: America's Fast Growing Communities and the Metropolitan Fringe. Washington, DC: The Brookings Institution.

BHHC. 1999. The Fruit Industry: VHS. Bunker Hill Historical Committee.

Bieber, S. 1987. Cooperatives Help the Individual to Buy, Sell His Products in the Big Marketplace. *The Morning Call*. Allentown, PA. February 22.

Biggs, A. 2011. *Fruit School Presentations, Virginia/West Virginia Conferences and Other Presentations*. West Virginia University, Kearneysville Tree Fruit Research and Education Center. Available from http://www.caf.wvu.edu/kearneysville/fruitschools.html. Accessed April 5, 2012.

Blank, S. C. 1998. *The End of Agriculture in the American Portfolio*. Westport, Conn: Quorum Books.

Blizzard, S. H. 1993. From Forty to Four: The Evolution of Tree Spacing in West Virginia. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 55-57. Charles Town, WV: Lowman Printing Company.

Blythe, B. 2010. *Vending Machines Offer Major Growth for Fruit, Vegetables*. The Packer. Available from http://thepacker.com/Vending-machines-offer-major-growth-for-fruit--vegetables/Article.aspx?oid=1231032&fid=PACKER-HANDLING-AND-DISTRIBUTING&aid=1662. Accessed February 7, 2011.

Boehlje, M. 1973. The Entry-Growth Processes in Agriculture. *Southern Journal of Agricultural Economics* 5 (1):23-36.

Boland, M., P. Mancia, and M. Taylor. 2007. *Tree Top: Looking Forward*. Agricultural Marketing Research Center. Available from http://www.agmrc.org/media/cms/TreeTopCaseRev_6658EB43A4E33.pdf Accessed March 18, 2011.

Boyer. 2007. *About Us*. Boyer Nurseries & Orchards, Inc. Available from http://www.boyernurseries.com/about.htm. Accessed February 14, 2010.

Bragg, L. A., and T. J. Dalton. 2004. Factors Affecting the Decision to Exit Dairy Farming: A Two-Stage Regression Analysis. *Journal of Dairy Science* 87 (9):3092-3098.

Brown, H. J., R. S. Phillips, and N. A. Roberts. 1981. Land Markets at the Urban Fringe: New Insights for Policy Makers. *Journal of the American Planning Association* 47:131-144.

Brown, S. K., and K. E. Maloney. 2009. Making Sense of the New Apple Varieties, Trademarks, and Clubs: Current Status. *New York Fruit Quarterly* 17 (3):9-12.

Brushett, L., and S. T. Lacasse. 2006. A Regional Market Analysis for Fresh-cut Apple Slices. South Deerfield, MA: Cooperative Development Institute.

Bryant, C. R. 1981. Agriculture in an Urbanizing Environment: A Case Study from the Paris Region, 1968-1976. *The Canadian Geographer* 25 (1):27-45.

ð ð ð . 1984. The Recent Evolution of Farming Landscapes in Urban-Centered Regions. *Landscape Planning* 11:307-326.

Bryant, C. R., and T. R. R. Johnston. 1992. *Agriculture in the City's Countryside*. Toronto: University of Toronto Press.

Buckner, L. 2009. *Apple and Pear Variety Production and Planting Trends in Washington State 2008.* Available from http://www.treetop.org/PDF/2008%20Tree%20Survey.pdf Accessed May 20, 2011.

Bump, M. N. 2005. From Temporary Picking to Permanent Plucking: Hispanic Newcomers, Integration, and Change in the Shenandoah Valley. In *Beyond the Gateway: Immigrants in a Changing America*, eds. E. M. Gozdziak and S. F. Martin, 137-175. Lanham, MD: Lexington Books.

Bunce, M. F. 1985. Agricultural Land as a Real Estate Commodity: Implications for Farmland Preservation in the North American Urban Fringe. *Landscape Planning* 12:177-192.

Burfield, T. 2010. *Bags Become Package of Choice for Michigan Apples*. The Packer. Available from http://www.thepacker.com/fruit-vegetable-news/shipping-profiles/michigan-apples/bags_become_package_of_choice_for_michigan_apples_122160559.html. Accessed June 1, 2011.

Burros, M. 2005. An Orchard-Tending Family that Found a Calling. *New York Times*, New York, NY, June 1.

Burt, L., J. Kropf, and C. Moulton. 2000. *Marketing Alternatives for Specialty Produce, PNW 241*. Pacific Northwest Extension Publications.

Burton, C. 2010. Apple Growers, Buyers 'Antsy'. *The Winchester Star*. Winchester, VA. September 23.

Buse, R. C., and D. W. Bromley. 1975. *Applied Economics: Resource Allocation in Rural America*. Ames, IA: Iowa State University Press.

Butler's Farm Market. 2011. *Butler Family History*. Butler's Farm Market. Available from http://gowhereitgrows.com/page0003.html. Accessed March 21, 2012.

Buzby, J. C., H. F. Wells, A. Kumcu, B.-H. Lin, G. Lucier, and A. Perez. 2010. *Canned Fruit and Vegetable Consumption in the United States: An Updated Report to Congress, AP-050*. Economic Research Service, United States Department of Agriculture.

Cable, S. 2010. *Sliced Apples Still Fresh-cut King*. The Packer. Available from http://thepacker.com/Sliced-apples-still-fresh-cut-king/Article.aspx?oid=1002668&fid=PACKER-SPECIAL-SECTIONS&aid=476. Accessed February 7, 2011.

Cain, D. W. 2005. Trends in Variety Introduction and Management. *New York Fruit Quarterly* 13 (3):28.

Calvin, L., R. Cook, M. Denbaly, C. Dimitri, L. Glaser, C. Handy, M. Jekanowski, P. Kaufman, B. Krissoff, G. Thompson, and S. Thornsbury. 2001. *U.S. Fresh Fruit and Vegetable Marketing: Emerging Trade Practices, Trends, and Issues, AER-795*. Economic Research Service, United States Department of Agriculture.

Calvin, L., and B. Krissoff. 2005. *Resolution of the U.S.-Japan Apple Dispute, FTS-318-01*. Economic Research Service, United States Department of Agriculture.

Canfield, C. 2011. *Heirloom Apples are Back in Fashion*. Huffington Post, September 7. Available from http://www.huffingtonpost.com/2011/09/07/heirloom-apples_n_952491.html. Accessed February 16, 2012.

Capozza, D. R., and R. W. Helsley. 1989. The Fundamentals of Land Prices and Urban Growth. *Journal of Urban Economics* 26:295-306.

Carroll, D., R. M. Samerdick, S. Bernard, S. Gabbard, and T. Hernandez. 2005. *Findings from the National Agricultural Workers Survey (NAWS) 2001-2002: A Demographic and Emplioyment Profile of United States Farm Workers, Research Report No. 9*. Office of the Assistant Secretary for Policy, Office of Programmatic Policy, United States Department of Labor.

Carter, N. T., and B. A. Cody. 2005. *The Civil Works Program of the Army Corps of Engineers: A Primer, RS20866*. Congressional Research Service.

Cash, A. J. 2002. Where's the Beef? Small Farms Produce Majority of Cattle. *Agricultural Outlook* (AGO-297):21-24.

CFM. 2012. *Company History*. Chelan Fresh Marketing. Available from http://www.chelanfresh.com/history/. Accessed May 2, 2012.

Che, D. 2006. Select Michigan: Local Food Production, Food Safety, Culinary Heritage, and Branding in Michigan Agritourism. *Tourism Review International* 9:349-363.

Che, D., A. Veeck, and G. Veeck. 2005a. Sustaining Production and Strengthening the Agritourism Product: Linkages among Michigan Agritourism Destinations. *Agriculture and Human Values* 22:225-234.

Che, D., G. Veeck, and A. Veeck. 2005b. Agritourism and the Selling of Local Food Production, Family and Rural American Traditions to Maintain Family Farming Heritage. In *Rural Change and Sustainability: Agriculture, the Environment and Communities*, eds. S. Essex, A. Gilg and R. Yarwood. Cambridge, MA: CABI Publishing.

Chicoine, D. L. 1981. Farmland Values at the Urban Fringe: An Analysis of Sale Prices. *Land Economics* 57 (3):353-362.

Church, A. H. 1993. Estimating the Effect of Incentives on Mail Survey Response Rates: A Meta-Analysis. *Public Opinion Quarterly* 57 (1):62-79.

CIPM. 2007. *Why Terminal Markets?* Chicago International Produce Market. Available from http://www.cipmarket.com/terminal_markets.htm. Accessed February 24, 2011.

Claasen, R. 2009. *Conservation Policy: Background*. Economic Research Service, United States Department of Agriculture. Available from www.ers.usda.gov/Briefing/ConservationPolicy/background.htm. Accessed November 22, 2010.

Clark, J. K., D. Jackson-Smith, J. S. Sharp, and D. K. Munroe. 2007. The Geography of US Peri-Urban Agricultural Adaptation. Paper read at TransAtlantic Land Use Conference, September 24-26, at Washington DC.

Clawson, M. 1962. Urban Sprawl and Speculation in Suburban Land. *Land Economics* 38 (2):99-111.

Clounts, H. A. 1970. Influence of Urbanization on Land Values at the Urban Periphery. *Land Economics* 46 (4):489-497.

Coggeshall, J. M. 1996. *Carolina Piedmont Country.* Jackson, MS: The University Press of Mississippi.

Cohn, D. V., and M. Laris. 2004. Loudoun Leads Nation in Growth: Exurbs Booming, Census Data Show. *Washington Post*. Washington, DC. April 9:A01.

Colby, S. 2011. *Conservation Practices and Irrigation Contribute to Thriving Orchard*. Country Folks Grower, 10 (4). Available from http://www.cfgrower.com/ME2/Audiences/dirmod.asp?sid=&nm=Features&type=Publishing&mod=Publications%3A%3AArticle&mid=8F3A7027421841978F18BE895F87F791&id=2A3BC22FE4DA4027A78A3F8426E98EE3&tier=4. Accessed March 16, 2012.

Consumer Reports. 2012. Arsenic in Your Juice. *Consumer Reports*, 77 (1): 22-27.

Cornell University. 2008. *History of the Experiment Station*. New York State Agricultural Experiment Station. Available from http://www.nysaes.cornell.edu/about/history.html. Accessed January 15, 2011.

Cotrill, C. 1993. Frost Protection in West Virginia Orchards. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 49-50. Charles Town, WV: Lowman Printing Company.

Coughlin, Keene & Associates. 1997. Clarke County Comprehensive Plan: Agricultural Land Plan.

Couper, W. 1952. *History of the Shenandoah Valley, Volume II*. New York City: Lewis Historical Publishing Company, Inc.

Cox, D. 2008. Knouse Plant Closing. *The Journal*. Martinsburg, WV. August 8.

Crassweller, R. M., L. F. Kime, and J. K. Harper. 2005. *Agricultural Alternatives: Apple Production*. Penn State University. Available from http://agalternatives.aers.psu.edu/Publications/appleprod.pdf Accessed December 15, 2010.

Crump, J. R. 2003. Finding a Place in the Country: Exurban and Suburban Development in Sonoma County, California. *Environment and Behavior* 35 (2):187-202.

Dalrymple, D. G. 1969. The Development of an Agricultural Technology: Controlled Atmosphere Storage of Fruit. *Technology and Culture* 10 (1):35-48.

Daniels, T. 2000. Integrated Working Landscape Protection: The Case of Lancaster County, Pennsylvania. *Society and Natural Resources* 13:261-271.

Danoy, J. 2010. Slim Pickings for Workers. *The Winchester Star*. Winchester, VA. September 7.

Davis, J. S., and A. C. Nelson. 1994. The New 'Burbs: The Exurbs and their Implications for Planning Policy. *Journal of the American Planning Association* 60 (1):45-60.

De Marree, A. 2010. New Varieties: Risk vs. Rewards and Success. *New York Fruit Quarterly* 18 (2):1-2.

Dearth, D. 2011. Co-op Gives Customers Ownership in Market. *The Herald-Mail*. Hagerstown, MD. April 11.

Deodhar, S. Y., M. Landes, and B. Krissoff. 2006. *Prospects for India's Emerging Apple Market, FTS-319-01*. Economic Research Service, United States Department of Agriculture.

Dillman, D. A. 1978. *Mail and Telephone Surveys: The Total Design Method*. New York City: John Wiley & Sons.

ð ð ð . 2007. *Mail and Internet Surveys: The Tailored Design Method*. 2nd ed. Hoboken, NJ: John Wiley & Sons, Inc.

Dimitri, C. 1999. *Integration, Coordination, and Concentration in the Fresh Fruit and Vegetable Industry, FTS-285*. Economic Research Service, United States Department of Agriculture.

Dimitri, C., J. C. Hanson, and L. Oberholtzer. 2010. Local Foods in Maryland Schools: A Real Possibility or a Wishful Dream? College Park, MD: Center for Agriculture and Natural Resource Policy, University of Maryland, http://agresearch.umd.edu/CANRP/Localfood/files/2010F2SMDResearch.pdf

Dimitri, C., and L. Oberholtzer. 2009. *Marketing U.S. Organic Foods: Recent Trends from Farms to Consumers, EIB-58*. Economic Research Service, United States Department of Agriculture.

DLC. 2011. *The Apples*. Distillery Lane Ciderworks. Available from http://distillerylaneciderworks.com/the-apples/. Accessed February 16, 2012.

Doherty, W. T. 1972. *Berkeley County, U.S.A.: A Bicentennial History of a Virginia and West Virginia County, 1772-1972*. Parsons, WV: McClain Printing Company.

Domoto, P. 2006. *Frost Protection for Fruit Crops*. Iowa State University Extension. Available from http://viticulture.hort.iastate.edu/info/06iawgmtg/frostprotectionhandout.pdf Accessed December 14, 2010.

Doyle, T. 2005. An Apple a Day...Until the Orchard Goes Away. *The Journal*. Martinsburg, WV. April 18.

Dr. Pepper Snapple Group. 2011. *Mott's*. Dr. Pepper Snapple Group. Available from http://www.drpeppersnapplegroup.com/brands/motts/. Accessed May 27, 2011.

Dunn, J., J. W. Berry, L. F. Kime, R. M. Harsh, and J. K. Harper. 2006 *Agricultural Alternatives: Developing a Roadside Farm Market*. Penn State University. Available from http://agalternatives.aers.psu.edu/Publications/roadside_farm.pdf Accessed April 21, 2010.

Dunn, J., J. K. Harper, and L. F. Kime. 2009. *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-scale and Part-time Growers*. Penn State University. Available from http://agalternatives.aers.psu.edu/Publications/MarketingFruitAndVeggie.pdf Accessed April 21, 2011.

Ebert, R. A., and T. Lazazzera. 1988. *Frederick County, Virginia: From the Frontier to the Future*. Norfolk: The Donning Company Publishers.

Economist, The. 2009. Fields of Automation. *The Economist* 393 (8661):22-23.

Eddy, D. 2010. *Club Variety Questions*. American/Western Fruit Grower. Available from http://www.growingproduce.com/article/11043/club-variety-questions Accessed February 21, 2012.

.

Edwards, G. 2004. Uprooting Virginia's Apple Industry: Foreign Competition, Weather Causing Some Apple Growers to Get Out. *The Winchester Star*. Winchester, VA. June 1.

Elliot, K. C. 1993. Mechanical Fruit Harvesting by West Virginia University. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 54-55. Charles Town, WV: Lowman Printing Company, Ltd.

Ellis, K. 2009. *Adams County Ag Innovations*. Penn State Cooperative Extension, Adams County.

ENZA. 2010. *Jazz Apple - Variety Profile*. ENZA. Available from http://www.jazzapple.com/varietyprofile.htm. Accessed February 22, 2012.

EPA. 2010. *Integrated Pest Management (IPM) Principles*. United States Evironmental Protection Agency. Available from http://www.epa.gov/pesticides/factsheets/ipm.htm. Accessed December 17, 2010.

Evans, H. C. 1957. *The Nature of Competition Among Apple Processors in the Appalachian Area, Bulletin 405*. Morgantown, WV: West Virginia Agricultural Experiment Station.

Evans, K. 2011. Paw Paw Seniors Reminisce about their Youth and the Town's Past. *The Morgan Messenger*. Berkeley Springs, WV. April 8, http://www.morganmessenger.com/news/content/story-7311.

Evans, S. 2009. A Better Labor Force. *American/Western Fruit Grower* 129 (1):30-31.

EWG. 2010. *Farm Subsidy Database*. Environmental Working Group. Available from http://farm.ewg.org/top_recips.php?fips=54000&progcode=apple&regionname=WestVirginia. Accessed January 9, 2011.

FCADC. 2006. *Pennsylvania's Military Bases and their Economic Impact on the Commonwealth*. Franklin County Area Development Corporation. Available from http://www.fcadc.com/pdf/PA%20Military%20Installations%20Economic%20Impact.pdf Accessed March 20, 2012.

ð ð ð . 2012. *2012 Franklin County Profile*. Franklin County Area Development Corporation. Available from http://www.fcadc.com/pdf/2012-Franklin-County-Profile.pdf Accessed March 20, 2012.

Feather, C. E. 2001. Apple Royalty: Berkeley County's Miller Family. *Goldenseal* 27 (3):6-13.

Fermata Inc. 2009. South Mountain Conservation Initiative Strategic Plan. Austin, TX: Fermata Inc.

Ferry, N. M., and W. C. Brock. 2003. The Changing Landscape of Central Pennsylvania: Agricultural Industry at a Crossroads. *Journal of Extension* 41 (4).

Fitzgerald, K. 2003. Changes in the New Zealand Apple Industry. *British Food Journal* 105 (1):78-95.

Folger, J. C., and S. M. Thomson. 1921. *The Commercial Apple Industry of North America*. New York: The MacMillan Company.

Foltz, J. D. 2004. Entry, Exit, and Farm Size: Assessing an Experiment in Dairy Price Policy. *American Journal of Agricultural Economics* 86 (3):594-604.

Ford, C. M. 2008. Higher Apple Prices Needed to Balance Production Costs. *The Winchester Star*. Winchester, VA. August 23.

Foster, N. 2009. *Right to the Core: The Importance of AgJobs*. American/Western Fruit Grower 129 (7). Available from http://www.growingproduce.com/article/3933/the-importance-of-agjobs. Accessed July 25 2012.

ð ð ð . 2010. *Right to the Core: Apple Industry Leadership for the Future*. American/Western Fruit Grower, 130 (4). Available from http://www.growingproduce.com/article/15518/right-to-the-core-apple-industry-leadership-for-the-future. Accessed April 6, 2012.

Foulke, J. E. 1993. FDA Reports on Pesticides in Foods. *FDA Consumer* 27 (5):28-32.

Foust, J. B., and A. R. deSouza. 1978. *The Economic Landscape: A Theoretical Introduction*. Columbus, OH: Charles E. Merrill Publishing Company.

Fresh Cut. 2008. *New Plant, Products, and People signal Growth for Processor*. Fresh Cut Magazine. Available from http://freshcut.com/index.php/magazine/article/New-plant-products-and-people-signal-growth-for-processor. Accessed March 25, 2012.

Freshplaza. 2007. *A Sweet Reputation: 'Chambersburg' Peaches in Their Peak*. Freshplaza. Available from http://www.freshplaza.com/news_detail.asp?id=5760. Accessed February 15, 2012.

ð ð ð . 2008. *Fresh Apple Demand Squeezes Processors.* Freshplaza. Available from www.freshplaza.com/print.asp?id=13722. Accessed May 13, 2010.

Fruit Grower News. 2005. *Fruit Industry Has Fresh Reason for Hope*. Fruit Grower News 44 (1) Available from http://fruitgrowersnews.com/index.php/magazine/article/Fruit-Industry-Has-Fresh-Reason-for-Hope. Accessed October 31, 2011.

ð ð ð . 2006. *Adams County Looks at Platforms for Mechanization*. Fruit Growers News 46 (12). Available from http://fruitgrowersnews.com/index.php/magazine/article/Adams-County-Looks-at-Platforms-for-Mechanization. Accessed July 24, 2012

ð ð ð . 2007. *Young Growers Ask: Should We Open the Door?* Fruit Grower News, 47 (11). Available from http://fruitgrowersnews.com/index.php/magazine/article/Young-growers-ask-Should-we-open-the-door. Accessed March 19, 2012

ð ð ð . 2008. *Growers Plan to Replant Some Orchard Sites Lost to Plum Pox*. Fruit Grower News, 47 (12). Available from http://fruitgrowersnews.com/index.php/magazine/article/Growers-Plan-To-Replant-Some-Orchard-Sites-Lost-To-Plum-Pox. Accessed February 14, 2012

ð ð ð . 2009a. *A Nifty Sucker: Vacuum Machine Harvests Fresh-Market Apples*. Fruit Grower News, 48 (12). Available from http://fruitgrowersnews.com/index.php/magazine/article/A-Nifty-Sucker-Vacuum-Machine-Harvests-Fresh-Market-Apples. Accessed February 8, 2012

ð ð ð . 2009b. *Not Many Have Been Able to Grow Them*. Fruit Grower News, 48 (1). Available from http://fruitgrowersnews.com/index.php/magazine/article/Not-Many-Have-Been-Able-To-Grow-Them. Accessed October 31, 2011.

ð ð ð . 2009c. *Position Your Place as a Safe Food Producer*. Fruit Grower News, 48 (4). Available from http://fruitgrowersnews.com/index.php/magazine/article/Position-Your-Place-as-a-Safe-Food-Producer. Accessed October 30, 2011.

Fryhover, T. 2010. Apple Lines - Full Access to China Needed. *Good Fruit Grower* 61 (7):32-33.

Furuseth, O. J., and J. T. Pierce. 1982. *Agricultural Land in an Urban Society*. Washington, DC: Association of American Geographers.

Gale, F. 1997. Direct Farm Marketing as a Rural Development Tool. *Rural Development Perspectives* 12 (2):19-25.

Gale, F., S. Huang, and Y. Gu. 2010. *Investment in Processing Industry Turns Chinese Apples into Juice Exports, FTS-344-01*. Economic Research Service, United States Department of Agriculture.

Gale, H. F. 1994. Longitudinal Analysis of Farm Size Over the Farmer's Life Cycle. *Review of Agricultural Economics* 16:113-123.

ð ð ð . 2003. Age-Specific Patterns of Exit and Entry in U.S. Farming, 1978-1997. *Review of Agricultural Economics* 25 (1):168-186.

Garreau, J. 1991. *Edge City: Life on the New Frontier*. New York: Doubleday.

Gereffi, G., J. Humphrey, and T. Sturgeon. 2005. The Governance of Global Value Chains. *Review of International Political Economy* 12 (1):78-104.

Gillespie, L. 2010. *An Apple A Day*. Food and Drink Magazine, Winter/Spring 2010, 116-117. Available from http://www.dixiebox.com/food-and-drink-mag.pdf Accessed April 25, 2012.

Glaize, P. 2010a. Personal Interview - Apple Grower and Wholesale Apple Packer, July 16.

ð ð ð . 2010b. *Testimony of Phil Glaize for the House Judiciary Committee's Subcommittee on Immigration, Refugees, and Border Security, September 24, 2010*. United States House of Representatives, Committee on Judiciary. Available from http://judiciary.house.gov/hearings/pdf/Glaize100924.pdf Accessed August 16, 2011.

Gomez, M. I., E. W. McLaughlin, and K. S. Park. 2010. *Case Studies on Local food Supply Chains: Apple Case Studies in the Syracuse, New York MSA*. Food Industry Center, University of Minnesota. Available from http://foodindustrycenter.umn.edu/prod/groups/cfans/@pub/@cfans/@tfic/documents/asset/cfans_asset_250525.pdf Accessed April 6, 2011.

Good Fruit Grower. 2010a. *Exclusively New York*. Good Fruit Grower 61 (12). Available from http://www.goodfruit.com/Good-Fruit-Grower/July-2010/Exclusively-New-York/. Accessed February 22, 2012.

ð ð ð . 2010b. *More Quantity than Quality in China*. Good Fruit Grower, 61 (17) 18-20. Available from http://www.goodfruit.com/Good-Fruit-Grower/December-2010/More-quantity-than-quality-in-China/. Accessed October 12, 2011.

ð ð ð . 2010c. *New Apples for New York*. Good Fruit Grower 61 (12). Available from http://www.goodfruit.com/Good-Fruit-Grower/July-2010/New-apples-for-New-York/. Accessed February 22, 2012.

Gottmann, J. 1961. *Megalopolis the Urbanized Northeastern Seaboard of the United States*. New York: Twentieth Century Fund.

Gould, P. 1963. Man Against His Environment: A Game Theoretic Framework. *Annals of the Association of American Geographers* 53 (3):290-297.

Govindasamy, R., F. Hossain, and A. Adelaja. 1999. Income of Farmers Who Use Direct Marketing. *Agricultural and Resource Economics Review* 28 (1):76-83.

Granatstein, D. 2000. Alternative Markets for Fruit: Organic and IFP. Paper read at 16th Annuual Postharvest Conference, March 14-15, at Yakima, WA.

Greene, R. P. 1997. The Farmland Conversion Process in a Polynucleated Metropolis. *Landscape and Urban Planning* 36:291-300.

Greene, R. P., and J. E. Benhart. 1992. The Encroachment of Megalopolis in the Great Valley: Evidence from the Cumberland Valley. *The Pennsylvania Geographer* 30 (1):30-46.

Greenhalgh, S. 2011. Arrival of Pickers Marks Apple Harvest. *The Winchester Star*. Winchester, VA. September 6.

Gregor, H. F. 1957. Urban Pressures on California Land. *Land Economics* 33 (4):311-325.

Griffith, D. 1986. Peasants in Reserve: Temporary West Indian Labor in the U.S. Farm Labor Market. *International Migration Review* 20 (4):875-898.

Growing Produce. 2012. *Bear Mountain Celebrates 75 Years*. Growing Produce. Available from http://www.growingproduce.com/article/26500/bear-mountain-celebrates-75-years. Accessed May 2, 2012.

Guenthner, J. F. 1993. *Identifying Domestic Markets: Indirect Marketing of Produce, CIS 981* University of Idaho College of Agriculture.

Guise, K. 2010. Personal Interview - CEO of Knouse Foods, July 13.

GWP. 2011. *Apples*. Gray Wolf Plantation. Available from http://www.graywolfplantation.com/Apples.htm. Accessed February 17, 2012.

Hall, M. L. 2002. Defending the Rights of H-2A Farmworkers. *North Carolina Journal of International Law and Commercial Regulation* 27:521-537.

Hansen, M. 2009. *How Many is Too Many?* Good Fruit Grower, 60 (17). Available from http://www.goodfruit.com/Good-Fruit-Grower/December-2009/How-many-is-too-many/. Accessed February 21, 2012.

Hanson, J. C., C. Dimitri, L. Olberholtzer, N. Richman, J. Gurley, and G. Brust. 2011. *Farm to School: Increasing Sales by Local Farmers for Healthier School Lunches and Higher Farm Income, Fact Sheet 933*. University of Maryland Extension. Available from http://agresearch.umd.edu/CANRP/Localfood/files/2011_UME_FS%20933.pdf Accessed December 23, 2011.

Harper, J. K. 2010. Adams County Fruit Industry Assessment. In *Northwest Adams County Comprehensive Plan*, ed. The Northwest Adams County Comprehensive Plan Steering Committee & Adams County Office of Planning & Development.

Harrison, F. P. 1987. *The History of Entomology at the University of Maryland. Part II: The Later Years*. University of Maryland, Department of Entomology. Available from http://entomology.umd.edu/files/entm/documents/about/Historyto1980s.pdf Accessed April 3, 2012.

Harsh, R. M. 2011. Industry Challenges and Opportunities. In *Specialty Crop Innovations Progress Report*, ed. T. Baugher: Penn State Fruit Research and Extension Center, Adams County.

Harstin, D. D., and F. O. Leuthold. 1995. The Waldens Ridge Producers Cooperative: A Cooperative's Failure Leads Researchers to Ask "Why?". *Tennessee Agri Science* (174):6-10.

Hart, J. F. 1968. Loss and Abandonment of Cleared Farm Land in the Eastern United States. *Annals of the Association of American Geographers* 58 (3):417-440.

ð ð ð . 1991. The Perimetropolitan Bow Wave. *Geographical Review* 81 (1):37-51.

ð ð ð . 2003. *The Changing Scale of American Agriculture*. Charlottesville, VA: University of Virginia Press.

ð ð ð . 2010. From Bolls to Boles. *Southeastern Geographer* 50 (2):189-199.

Hart, J. F., and C. Mayda. 1998. The Industrialization of Livestock Production in the United States. *Southeastern Geographer* 38 (1):58-78.

Hartshorn, T. A. 1992. *Interpreting the City: An Urban Geography*. 2nd ed. New York: John Wiley & Sons.

Hartshorn, T. A., and P. O. Muller. 1992. The Suburban Downtown and Urban Economic Development Today. In *Sources of Metropolitan Growth*, eds. E. S. Mills and J. F. McDonald. New Brunswick, NJ: Center for Urban Policy Research.

Harvey, D. W. 1966. Theoretical Concepts and the Analysis of Agricultural Land-Use Patterns in Geography. *Annals of the Association of American Geographers* 56 (2):361-374.

HEDC. 2011. *2011 Business & Industry Directory, Washington County, Maryland*. Hagerstown Economic Development Commission. Available from http://www.hagerstownedc.org/downloads/2011%20Business%20Directorywebversion.pdf Accessed March 20, 2012.

Heffernan, J. 2009. Proctor Takes Reins at Bowman Apple. *The Northern Virginia Daily*. Strasburg, VA. September 2.

Hefling, K. 2007. U.S. Apple Growers Feel Heat from China. *International Herald Tribune*. New York, NY. June 25.

Heimlich, R. E., and W. D. Anderson. 2001. *Development at the Urban Fringe and Beyond: Impacts on Agriculture and Rural Land, AER-803*. Economic Research Service, United States Department of Agriculture.

Henry, B. 2005. Ripe for the Picking. *The Journal*. Martinsburg, WV. Oct. 16.

Heppel, M. L., J. Spano, and L. R. Torres. 1997. Changes in the Apple Harvest Work Force in West Virginia: Implications for the Community. Paper read at The Changing Face of Rural America: Focus on the Mid-Atlantic and Southeastern States Conference, September 11-13, at Newark, DE, http://migration.ucdavis.edu/cf/more.php?id=151_0_2_0.

Herald-Mail. 2010. In Eastern Panhandle, Byrd's Reach was Wide. *Herald-Mail*. Hagerstown, MD. June 29.

Higgins, A. 2005. Why the Red Delicious No Longer Is. *The Washington Post*, Washington, DC. August 5.

Hogmire, H. W. 1993. Pest Management. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 26-27. Charles Town, WV: Lowman Printing Company.

Hollabaugh, B. 2012. *Common Sense and Immigration in the U.S.* State Horticultural Association of Pennsylvania. Available from http://shaponline.org/?page_id=169. Accessed July 25, 2012.

Holton, R. 1986. Production Blossoming at Red Cheek. *The Morning Call*. Allentown, PA. October 5.

Holz-Clause, M. 2003. *Hard Cider Industry Profile*. Agricultural Marketing Research Center. Available from http://www.agmrc.org/media/cms/hardciderprofile_FDF47F03DA2E8.pdf Accessed March 20, 2011

Hoppe, R. A., and D. E. Banker. 2010. *Structure and Finances of U.S. Farms: Family Farm Report, 2010 Edition, EIB-66* Economic Research Service, United States Department of Agriculture.

Hoppe, R. A., and P. Korb. 2001. Farm Operations Facing Development: Results from the Census Longitudinal File. Paper read at Annual Meeting of the American Agricultural Economics Association, August 5-8, at Chicago, IL.

ð ð ð . 2006. *Understanding U.S. Farm Exits, ERR-21*. Economic Research Service, United States Department of Agriculture.

Hornick, M. 2011a. *California Apples Vie with Imports*. The Packer. Available from http://www.thepacker.com/fruit-vegetable-news/crops-markets/california_apples_vie_with_imports_122060934.html. Accessed June 4, 2011.

ð ð ð . 2011b. *Fast Food Feeds Sales Growth in Foodservice*. The Packer. Available from http://www.thepacker.com/fruit-vegetable-news/marketing-profiles/apples/Fast-food-feeds-sales-growth-foodservice-136435918.html. Accessed March 1, 2012.

ð ð ð . 2011c. *More Varieties Compete for Space*. The Packer. Available from http://www.thepacker.com/fruit-vegetable-news/marketing-profiles/apples/More-varities-compete-for-space-136435878.html. Accessed February 20, 2012.

ð ð ð . 2011d. *Verdict Not Yet in on Response to Autumn Glory*. The Packer. Available from http://www.thepacker.com/fruit-vegetable-news/marketing-profiles/apples/Verdict-not-yet-in-on-response-to-Autumn-Glory-136435553.html. Accessed February 20, 2012.

ð ð ð . 2012. *Cuba, South America Get a Taste of Turkey Knob Apples*. The Packer. Available from http://www.thepacker.com/fruit-vegetable-news/marketing-profiles/apples/Cuba-South-America-get-a-taste-of-Turkey-Knob-apples-136436358.html. Accessed March 29, 2012.

Horst, D. ed. 1999. *100 Years with the Adams County Fruit Growers Association in the Twentieth Century*. Biglerville, PA: Adams County Fruit Growers Association.

Hoying, S. A., D. Rosenberger, and G. Lamont. 2006. The Apple Industry in China. *New York Fruit Quarterly* 14 (1):13-20.

Huang, S., and F. Gale. 2006. *China's Rising Fruit and Vegetable Exports Challenge U.S. Industries, FTS-320-01*. Economic Research Service, United States Department of Agriculture.

Huang, S., and K. Huang. 2007. *Increased U.S. Imports of Fresh Fruit and Vegetables, FTS-328-01*. Economic Research Service, United States Department of Agriculture.

Hubbuch, C. 2010. Forbidden Fruit: A New Apple, the SweeTango, at Center of Controversy. *La Crosse Tribune*. La Crosse, WI. August 29.

Huehn, W. G. 1993. An Overview of Fruit Processing in the Eastern Panhandle of West Virginia. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 43-44. Charles Town, WV: Lowman Printing Company.

Hull, L., and G. Krawczyk. 2011. *Maintaining the Integrity of IPM in Pennsylvania While Battling the Brown Marmorated Stink Bug. Fruit Times* Penn State Extension. Available from http://extension.psu.edu/fruit-times/news/2011/maintaining-the-integrity-of-ipm-in-pennsylvania-while-battling-the-brown-marmorated-stink-bug. Accessed July 27, 2012.

Hull, L., H. Ngugi, G. Krawczyk, J. Travis, K. Ellis, J. Remcheck, K. Lewis, G.-A. Hoheisel, V. Jones, A. Tabb, M. Glenn, S. Singh, M. Bergerman, and J. Park. 2011. Video, Laser, and Satellite Imaging. In *Specialty Crop Innovations Report*, ed. T. Baugher: Penn State Fruit Research and Extension Center, Adams County.

Hunt, J. 2011. Land Lover. *Daily News-Record*. Harrisonburg, VA. March 28.

Hushak, L. J. 1975. The Urban Demand for Urban-Rural Fringe Land. *Land Economics* 51 (2):112-123.

Idlebrook, C. 2010. Long Wait for Immigration Reform. *Good Fruit Grower* 61 (4):33-34.

IFTA. 2011. *About IFTA*. Drake and Company. Available from http://ifruittree.site-ym.com/?page=AboutIFTA. Accessed January 17, 2011.

Immigration Policy Center. 2008. *Summary of AgJobs: The Agricultural Job Opportunities, Benefits, and Security Act of 2007*. American Immigration Council. Available from http://www.immigrationpolicy.org/just-facts/summary-agjobs-agricultural-job-opportunities-benefits-and-security-act-2007. Accessed July 25, 2012.

Jackson-Smith, D., J. K. Clark, J. S. Sharp, and S. Inwood. 2008. Local Agency and Trajectories of Agricultural Change at the Rural-Urban Interface in the United States. Paper read at Transitions in Urban Agriculture Conference, at Wageningen, Netherlands.

Jackson-Smith, D. B. 1999. Understanding the Microdynamics of Farm Structural Change: Entry, Exit, and Restructuring among Wisconsin Family Farmers in the 1980's. *Rural Sociology* 64 (1):66-91.

Jacobs, J. A. 1990. *Fruit and Vegetable Cooperatives, Cooperative Information Report 1, Section 13*. Agricultural Cooperative Service, United States Department of Agriculture.

James, J. M., and R. Bolstein. 1990. The Effect of Monetary Incentives and Follow-up Mailings on the Response Rate and the Response Quality in Mail Surveys. *Public Opinion Quarterly* 54 (3):346-361.

ð ð ð . 1992. Large Monetary Incentives and their Effect on Mail Survey Response Rates. *Public Opinion Quarterly* 56:442-453.

Jarosz, L., and J. Qazi. 2000. The Geography of Washington's World Apple: Global Expressions in a Local Landscape. *Journal of Rural Studies* 16:1-11.

JHC. 2011. *Our History*. Jacks Hard Cider. Available from http://jackshardcider.com/our-history/. Accessed February 17, 2012.

Kane, J. A. 2008. After Many Tough Years, Orchardists Still Hopeful. *The Winchester Star*. Winchester, VA. August. 23.

Kaplowitz, M. D., T. D. Hadlock, and R. Levine. 2004. A Comparison of Web and Mail Survey Rates. *Public Opinion Quarterly* 68 (1):94-101.

Karst, T. 2011a. *Karst Chat with Neal Carter: On the GM Arctic Apple*. Fresh Talk Blog, The Packer. Available from http://thepacker.com/Karst-chat-with-Neal-Carter--On-the-GM-Arctic-apple/FreshTalkBlog.aspx?oid=1297587&tid=. Accessed February 7, 2011

ð ð ð . 2011b. *USDA Announces Value-Added Apples, Carrots Purchases*. Available from http://thepacker.com/USDA-announces-value-added-apple--carrot-purchases/Article.aspx?oid=1305283&fid=PACKER-FOODSERVICE&aid=117. Accessed February 7, 2011

Kaufman, P., and A. Kumcu. 2010. *Food Marketing System in the U.S.: Food Retailing*. Economic Research Service, United States Department of Agriculture. Available from http://www.ers.usda.gov/Briefing/FoodMarketingSystem/foodretailing.htm. Accessed November 19, 2011.

Kearns, D. 2010. Personal Interview - Apple Grower, June 23.

KFM. 2011. *Meet Our Growers*. Keystone Fruit Marketing, Inc. Available from http://www.keystonefruit.com/KeystoneFruit/commodities/apples/growers_main.aspx. Accessed February 13, 2012.

Kilmer, B. 1993. History of Labor in WV Orchards. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 42-43. Charles Town, WV: Lowman Printing Company.

Kimes Cider Mill. 2011. *About Kimes Cider Mill*. Available from http://kimescidermill.com/about.html. Accessed December 1, 2011

King, R. P., M. S. Hand, G. DiGiacomo, K. Clancy, M. I. Gomez, S. D. Hardesty, L. Lev, and E. W. McLaughlin. 2010. *Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply Chains, ERR-99*. Economic Research Service, United States Department of Agriculture.

Kitchen, C., and R. Boarman. 2010. Personal Interview - Fruit Growers, September 1.

Kneebone, E. 2009. Job Sprawl Revisited: The Changing Geography of Metropolitan Employment. Washington, DC: The Brookings Institution.

Knouse Foods. 2010. *Plant Locations*. Knouse Foods Cooperative. Available from http://www.knouse.com/AboutUs/PlantLocations.aspx. Accessed June 2, 2011.

Knox, P. L. 1991. The Restless Urban Landscape: Economic and Sociocultural Change and the Transformation of Metropolitan Washington, DC. *Annals of the Association of American Geographers* 81 (2):181-209.

Komancheck, W. 2010. *Fruit Belt of the North: The Growers of Adams County*. Growing Magazine, 8 (4). Available from http://www.growingmagazine.com/print-5130.aspx. Accessed March 30, 2012.

Kosnett, J. 1992. Houses for Sale - Cheap - In the Exurbs. *Kiplinger's Personal Finance Magazine* 46 (12):18.

Kowitt, B. 2011. Why McDonalds Wins in Any Economy. *Fortune*, 164 (4), September 5, 71-77.

Krawczyk, G. ed. 2010. *Pennsylvania Tree Fruit Production Guide, AGRS-045*. 2010-2011 ed. University Park, PA: Pennsylvania State University.

Kremer, A. 2006. Winchester Venture Hopes a Half-Apple a Day Gets Virginia School Districts to Pay. *Times-Dispatch*. Richmond, VA. August 12.

Krueger, R. R. 1978. Urbanization of the Niagara Fruit Belt. *The Canadian Geographer* 22 (1):179-194.

Kuhn, S. 2010. Personal Interview - Grower and President of the Young Growers Association, July 8.

Kyriakoudes, L. M. 2003. *The Social Origins of the Urban South: Race, Gender, and Migration in Nashville and Middle Tennessee, 1890-1930*. Chapel Hill, NC: The University of North Carolina Press.

Lang, R. E. 2003. *Edgeless Cities: Exploring the Elusive Metropolis*. Washington D.C.: Brookings Institution Press.

Lapping, M. B. 1980. Agricultural Land Retention: Responses, American and Foreign. In *The Farm and the City: Rivals or Allies*. Englewood Cliffs, NJ: Prentice Hall.

Laris, M. 2003. Loudoun Landowners Battle Building Curbs. *Washington Post*. Washington, DC. August 17:A01.

Larson, J. M., J. L. Findeis, and S. M. Smith. 2001. Agricultural Adaptation to Urbanization in Southeastern Pennsylvania. *Agricultural and Resource Economics Review* 30 (1):32-43.

Lawrence, H. W. 1988. Changes in Agricultural Production in Metropolitan Areas. *Professional Geographer* 40 (2):159-175.

Lehnert, R. 2007a. *Experts Mull Over Rising Demand and Price for Apples*. The Fruit Growers News, 46 (10). Available from http://fruitgrowersnews.com/index.php/magazine/article/Experts-Mull-Over-Rising-Demand-and-Price-for-Apples. Accessed August 27, 2011.

ð ð ð . 2007b. *Prices of Juice Apples Have Gotten Positively...Juicy*. The Fruit Growers News 46 (12). Available from http://fruitgrowersnews.com/index.php/magazine/article/Prices-of-Juice-Apples-Have-Gotten-Positively-...-Juicy. Accessed August 27, 2011.

ð ð ð . 2007c. Q&A: Young Fruit Growers Optimistic About Future of Industry. *The Fruit Growers News* 46 (12).

ð ð ð . 2010a. Apple Growers Need Good Niche Apples. *Good Fruit Grower* 61 (12):22-24.

ð ð ð . 2010b. Growers Tackle Onerous Stinkbug. *Good Fruit Grower* 61 (15):14-15.

ð ð ð . 2010c. High Density Apple Systems Cost More. *Good Fruit Grower* 61 (13):50-51.

ð ð ð . 2010d. New Vitality in New York. *Good Fruit Grower* 61 (14):17.

ð ð ð . 2010e. *The Next Generation*. Good Fruit Grower 61 (15). Available from http://www.goodfruit.com/Good-Fruit-Grower/October-2010/The-next-shygeneration/. Accessed May 1, 2012.

ð ð ð . 2010f. Renewal on the Ridge. *Good Fruit Grower* 61 (8):26-27.

ð ð ð . 2010g. *Vacuum Harvester Passes Bruising Tests*. Good Fruit Grower, 62 (17). Available from http://www.goodfruit.com/Good-Fruit-Grower/December-2010/Vacuum-harvester-passes-bruising-tests/. Accessed February 8, 2012.

ð ð ð . 2010h. You Hear that Buzz? It's SweeTango Apples Coming to Market. *Good Fruit Grower* 61 (10):32-33.

ð ð ð . 2011a. *Blossom Thin Peaches*. Good Fruit Grower, 62 (17). Available from http://www.goodfruit.com/Good-Fruit-Grower/December-2011/Blossom-thin-peaches/. Accessed February 10, 2012.

ð ð ð . 2011b. *Canadian Firm Seeks Approval for Transgenic, Non-Browning Apple*. Good Fruit Grower, 62 (1). Available from http://www.goodfruit.com/Good-Fruit-Grower/January-15th-2011/Firm-seeks-approval-for-transgenic-apple/. Accessed February 20, 2012.

ð ð ð . 2011c. *Grower Battles Bug*. Good Fruit Grower, 62 (5). Available from http://www.goodfruit.com/Good-Fruit-Grower/March-1st-2011/Grower-battles-bug/. Accessed March 21, 2012.

ð ð ð . 2011d. *Growers Battle Stinkbug*. Good Fruit Grower 62 (15). Available from http://www.goodfruit.com/Good-Fruit-Grower/October-2011/Growers-battle-stinkbug/. Accessed July 27, 2012.

ð ð ð . 2011e. *Knouse Has Wide Reach*. Good Fruit Grower 62 (9). Available from http://www.goodfruit.com/Good-Fruit-Grower/May-1st-2011/Knouse-has-wide-reach/. Accessed March 20, 2012.

ð ð ð . 2011f. *Unusual Apples are Researcher's Passion*. Good Fruit Grower, 62 (6). Available from http://www.goodfruit.com/Good-Fruit-Grower/March-15th-2011/Unusual-apples-are-researcher-rsquos-passion/. Accessed February 16, 2012.

ð ð ð . 2012a. *Challenges Lead to Changes*. Good Fruit Grower, 63 (1) 2012 [cited February 14, 2012. Available from http://www.goodfruit.com/Good-Fruit-Grower/January-1st-2012/Challenges-lead-to-changes/.

ð ð ð . 2012b. *Quality Fruit is Rice Heritage*. Good Fruit Grower, 63 (1) 2012 [cited February 8, 2012. Available from http://www.goodfruit.com/Good-Fruit-Grower/January-1st-2012/Quality-fruit-is-Rice-heritage/.

ð ð ð . 2012c. *The Time is Right*. Good Fruit Grower, 63 (1) 2012 [cited March 29, 2012. Available from http://www.goodfruit.com/Good-Fruit-Grower/January-1st-2012/The-time-is-right/.

Leskey, T. 2011. *Emergence of the Invasive Brown Marmorated Stink Bug as a Serious Agricultural and Nuisance Pest in the U.S. (video)*. Fresh and Local CSA. Available from http://freshandlocalcsa.com/videopage.html. Accessed July 20, 2012

Leung, S. 2011. Future Trends of Chinese Fuji Apples. Paper read at Asia Fruit Congress, September 7-9, at Hong Kong, China.

Leuthold, F. O. 1987. Who is the Farmer of the Future and Who Will Serve Him? *American Cooperation*:30-38.

Levy, F. 2010. *America's 25 Richest Counties*. Forbes.com. Available from http://www.forbes.com/2010/03/04/america-richest-counties-lifestyle-real-estate-wealthy-suburbs.html. Accessed March 20, 2012.

Lewis, P. 1995. The Urban Invasion of Rural America: The Emergence of the Galactic City. In *The Changing American Countryside: Rural People and Places*, ed. E. N. Castle, 39-62. Lawrence, KS: University Press of Kansas.

Libby, L. W., and P. A. Stewart. 1999. The Economics of Farmland Conversion. In *Under the Blade: The Conversion of Agricultural Landscapes*, eds. R. H. Olson and T. A. Lyson. Boulder, CO: Westview Press.

Lockeretz, W., J. Freedgood, and K. Coon. 1987. Farmers' Views of the Prospects for Agriculture in a Metropolitan Area. *Agricultural Systems* 23 (1):43-61.

Lohr, S. L. 1999. *Sampling: Design and Analysis*. Pacific Grove, CA: Duxbury Press.

Lubowski, R. N., A. J. Plantinga, and R. N. Stavins. 2008. What Drives Land-Use Change in the United States? A National Analysis of Landowner Decisions. *Land Economics* 84 (4):529-550.

Lucier, G., S. Pollack, M. Ali, and A. Perez. 2006. *Fruit and Vegetable Backgrounder, VGS-313-01*. Economic Research Service, United States Department of Agriculture.

Lynch, B. 2010. *Apples: Industry & Trade Summary, ITS-04*. Office of Industries, United States International Trade Commission.

Lynch, L., and J. Carpenter. 2003. Is there Evidence of a Critical Mass in the Mid-Atlantic Sector Between 1949-1997? *Agricultural and Resource Economics Review* 32 (1):116-128.

MacDonald, J., J. Perry, M. Ahearn, D. E. Banker, W. Chambers, C. Dimitri, N. Key, K. Nelson, and L. Southard. 2004. *Contracts, Markets, and Prices: Organizing the Production and Use of Agricultural Commodities, AER-837*. Economic Research Service, United States Department of Agriculture.

Machemer, A. T., and N. Miller. 1993. The Largest Apple Orchards. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 41-42. Charles Town, WV: Lowman Printing Company.

MACMA. 2008. *Bargaining for Minimum Price*. Michigan Agricultural Cooperative Marketing Association, Michigan Processing Apple Growers Division. Available from http://www.macmaapples.com/index.php?pageid=3. Accessed June 1, 2011.

Mangino, S. M. 2006a. The Sweet Fruit of His Labors. *Winchester Star.* Winchester, VA. September 19.

ð ð ð . 2006b. Time Takes Another Bite: Clarke County's Peter Cook Drops Apples. *The Winchester Star*. Winchester, VA. April 20.

ð ð ð . 2007. Heritage Apples. *The Winchester Star*. Winchester, VA. November 27.

MAPB. 2008. *Maryland Apple Promotion Board*. Maryland Apple Promotion Board. Available from http://www.marylandapples.org/. Accessed March 30, 2012.

Marini, R. P. 2009. *Growing Apples in Virginia, Publication 422-023*. Virginia Cooperative Extension.

ð ð ð . 2010. Personal Interview - Department Head, Department of Horticulture, Penn State University, July 27.

Martin, S., and R. Martin. 2010. Personal Interview - Organic Farmers, June 24.

Martinez, S. W. 2007. *The U.S. Food Marketing System: Recent Developments, 1997-2006, ERR-42*. Economic Research Service, United States Department of Agriculture.

Martinez, S. W., M. S. Hand, M. Da Pra, S. Pollack, K. Ralston, T. Smith, S. Vogel, S. Clark, L. Lohr, S. Low, and C. Newman. 2010. *Local Food Systems: Concepts, Impacts, and Issues, ERR-97*. Economic Research Service, United States Department of Agriculture.

MCAP. 2010. *McCutcheon's Apple Products, Inc.* McCutcheonôs Apple Products. Available from https://www.bobmccutcheon.com/newmccutcheons/indexmain.htm. Accessed July 9, 2012.

McCarthy, K. E. 2008. *OLR Research Reports: Manufacturing Apple Cider, 2008-R-0522*. Connecticut General Assembly. Available from http://www.cga.ct.gov/2008/rpt/2008-R-0522.htm. Accessed January 11, 2011.

McCarty, H. H., and J. B. Lindberg. 1966. *A Preface to Economic Geography*. Englewood Cliffs, NJ: Prentice Hall, Inc.

McKenna, M., and W. E. Murray. 2002. Jungle Law in the Orchard: Comparing Globalization in the New Zealand and Chilean Apple Industries. *Economic Geography* 78 (4):495-514.

McKenna, M., M. Roche, and R. Le Heron. 1998. Sustaining the Fruits of Labor: A Comparative Localities Analysis of the Integrated Fruit Production Programme in New Zealand's Apple Industry. *Journal of Rural Studies* 14 (4):393-409.

McMillion, D. 2005. Developers to Remove Contaminated Soil at Huntfield. *Herald-Mail*. Hagerstown, MD. October 11.

Merwin, I. A. 2008. Some Antique Apples for Modern Orchards. *New York Fruit Quarterly* 16 (4):11-17.

Michigan Ag Connection. 2011. *Comparing Apples to Oranges: Michigan Snowbirds Flourish in Florida*. Available from http://www.michiganagconnection.com/story-state.php?Id=106&yr=2011. Accessed June 1, 2011.

Milkovich, M. 2010a. *Managed Releases Divide Apple Industry*. Fruit Grower News, 49 (12). Available from http://fruitgrowersnews.com/index.php/magazine/article/managed-releases-divide-apple-industry. Accessed February 22, 2012.

ð ð ð . 2010b. *Mexico Puts Tariffs on Apples, Other Goods*. The Fruit Growers News, 49 (10). Available from http://fruitgrowersnews.com/index.php/magazine/article/mexico-puts-tariff-on-apples-other-goods. Accessed October 12, 2011.

Miller, N. 1993a. Mountain Orchards. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 35-36. Charles Town, WV: Lowman Printing Company.

ð ð ð . 1993b. Time Line: Notable Events in the History of WV Horticulture. In *One Hundred Years: West Virginia State Horticultural Society*, ed. N. Miller, 3-61. Charles Town, WV: Lowman Printing Company.

ð ð ð . 1993c.Trends. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 5-7. Charles Town, WV: Lowman Printing Company.

Miller, S. 2010. Personal Interview - Fruit Grower and Research Horticulturist, USDA Appalachian Fruit Research Station, May 19

.

Mines, R. 1997. Ethnic Shift in Eastern Crop Agriculture: Replacement or Displacement? Paper read at The Changing Face of Rural America: Focus on the Mid-Atlantic and Southeastern States Conference, September 11-13, at Newark, DE, http://migration.ucdavis.edu/cf/more.php?id=149_0_2_0.

Mishra, A. K., H. S. El-Osta, and J. D. Johnson. 2004. Succession in Family Farm Business: Empirical Evidence from the U.S. Farm Sector. Paper read at American Agricultural Economics Association, August 1-4, 2004, at Denver, Colorado.

Mishra, A. K., M. Raggi, and D. Viaggi. 2010. Determinants of Farm Exit: A Comparison Between Europe and the United States. Paper read at EAAE Seminar "Structural Change in Agriculture", at Berlin, Germany.

Molenda, R. 2012. Apples to Apples: After Canceling Contracts, Mott's Asks for Help. *The Journal*. Martinsburg, WV. July 4.

Molotch, H. 1976. The City as a Growth Machine: Toward a Political Economy of Place. *The American Journal of Sociology* 82 (2):309-332.

Morton, F. 1925. *The Story of Winchester in Virginia*. Strasburg, VA: Shenandoah Publishing House.

Motts. 2010. *Apple Varieties*. Mottôs. Available from http://www.motts.com/ApplesAndHealth/AboutApples/Varieties.aspx. Accessed June 20, 2011

Muller, P. O. 1981. *Contemporary Suburban America*. Englewood Cliffs, NJ: Prentice Hall.

Musselman, C. 2009a. *Spotlight on Agriculture 2009: Agritourism*. Penn State Cooperative Extension, Adams County. Available from http://adams.extension.psu.edu/Agriculture/News%20Articles/Spotlight%20on%20Ag/Agritourism.html Accessed October 16, 2010.

ð ð ð . 2009b. Spotlight on Agriculture 2009: Robotics: Penn State Cooperative Extension, Adams County.

NACJCP. 2010. *Northwest Adams County Joint Comprehensive Plan*. The Northwest Adams County Comprehensive Plan Steering Committee & Adams County Office of Planning & Development. Available from http://www.adamscounty.us/LinkClick.aspx?fileticket=S8eDmnSMxFo%3d&tabid=179&mid=2356. Accessed March 16, 2012.

Nagurny, K. 2002. *Pennsylvania Apples: History and Culture*. Mechanicsburg, PA: Stackpole Books.

NEAA. 2008. *About the Association*. New England Apple Association. Available from http://www.newenglandapples.org/AboutUs-id-2.html. Accessed June 5, 2011.

ð ð ð . 2011a. *Orchards by State*. New England Apple Association. Available from http://www.newenglandapples.org/OrchardsByState-id-5.html. Accessed June 5, 2011.

ð ð ð . 2011b. *Wholesale Suppliers of New England Apples*. New England Apple Association. Available from http://www.newenglandapples.org/Wholesale-id-25.html. Accessed June 5, 2011

Neal, M. 2010. Farm to School. *The Frederick News Post*. Frederick, MD. September 13.

Nehring, R., J. Fernandez-Cornejo, and D. E. Banker. 2002. Off-Farm Labor and the Structure of U.S. Agriculture: The Case of Corn/Soybean Farms. Paper read at Annual Meeting of the American Agricultural Economics Association, at Long Beach, CA.

Nelson, A. 2010. *Crunch Pak Shipping from Pennsylvania Plant*. The Packer. Available from http://www.thepacker.com/fruit-vegetable-news/fresh-produce-handling-distributing/crunch_pak_shipping_from_pennsylvania_plant_122081339.html. Accessed March 26, 2010.

Nelson, H. J. 1959. The Spread of an Artificial Landscape over Southern California. *Annals of the Association of American Geographers* 49 (3):80-99.

NFPC. 2010. *History*. National Fruit Product Company. Available from http://www.whitehousefoods.com/History.aspx. Accessed August 5, 2011.

Nichols, C. 2007. *Alumni Profiles: Charles Solenberger '57, Growing a Family Orchard*. Technology Review, 114 (4). Available from http://www.technologyreview.com/article/18925/. Accessed July 23, 2011.

NYAS. 2011. *Home*. New York Apple Sales. Available from http://www.newyorkapplesales.com/. Accessed July 18, 2012.

Oates, C. 2007. A Growing Business. *B2B Outlook* 2 (9):14-15.

Offner, J. 2011a. *Bulk Means Choice, Bags Mean Savings in Fresh Apple Business*. The Packer. Available from http://thepacker.com/Bulk-means-choice--bags-mean-savings-in-fresh-apple-business/Article.aspx?oid=1296224&fid=PACKER-SPECIAL-SECTIONS&aid=212. Accessed March 23, 2011.

ð ð ð . 2011b. *Institutional Business Feeds Apple Sales in Restaurants*. The Packer. Available from http://thepacker.com/Institutional-business-feeds-apple-sales-in-restaurants/Article.aspx?oid=1296689&fid=PACKER-SPECIAL-SECTIONS&aid=212. Accessed March 23, 2011.

Olsen, D. 2007. *Honeycrisp Apple Losing its Patent Protection, but Not its Appeal*. Minnesota Public Radio. Available from http://minnesota.publicradio.org/display/web/2007/10/11/honeycrisp/. Accessed February 22, 2012.

Olson, R. H. 1999. A Landscape Perspective on Farmland Conversion. In *Under the Blade: The Conversion of Agricultural Landscapes*, eds. R. H. Olson and T. A. Lyson. Boulder, CO: Westview Press.

O'Rourke, A. D. 1994. *The World Apple Market*. New York: Food Products Press.

ð ð ð . 1998. World Apple Marketing Dynamics. Paper read at 41st Annual International Dwarf Fruit Tree Association Conference, at Pasco, WA.

ð ð ð . 2001. A Survey of the World's Major Apple Producers. *New York Fruit Quarterly* 9 (1):21-23.

ð ð ð . 2002. Major Trends in U.S. and World Apple Markets. *New York Fruit Quarterly* 10 (4):9-16.

ð ð ð . 2009. *Lowdown on Buying Local*. Belrose Inc. Available from http://www.e-belrose.com/PDFs/2Lowdown%20on%20Buying%20Local%20Word%2097%20Version-1.pdf Accessed April 7, 2011.

Orrs. 2010. Field Trip Notes from Orr's Farm Market and Orchard, June 17.

Orr's Farm Market. *Wholesale*. Orr's Farm Market 2010 [cited May 1, 2012. Available from http://orrsfarmmarket.corecommerce.com/Wholesale.html.

Owings, M. 2007. *Henderson Co. Apple Industry - Past, Present, and Future*. Blue Ridge Apple Growers Accessed. Available from http://blueridgeapplegrowers.com/07AppleIndustryHistory.ppt#358,1,Henderson Co. Apple Industry ï Past, Present and Future 2007

PAMP. 2010. *Who We Are*. Pennsylvania Apple Marketing Program. Available from http://www.pennsylvaniaapples.org/AboutthePennsylvaniaAppleMarketingProgram/WhoWeAre.aspx. Accessed March 30, 2012.

Parker, M. L. 1993. Apple Rootstocks and Tree Spacing, Leaflet No. 300-A: North Carolina Cooperative Extension Service.

Parsons, J. J. 1986. A Geographer Looks at the San Joaquin Valley. *Geographical Review* 76 (4):371-389.

PASA. 2006. *Assessing the Status of Small to Mid-Size Cider Press Operations in Pennsylvania.* Pennsylvania Association for Sustainable Agriculture. Available from http://www.pasafarming.org/resource/PDF/CiderSurvey.pdf Accessed January 11, 2011.

Perez, A. 2012a. *Fruit and Tree Nuts: Policy*. Economic Research Service, United States Department of Agriculture. Available from http://www.ers.usda.gov/topics/crops/fruit-tree-nuts/policy.aspx. Accessed July 30, 2012.

ð ð ð . 2012b. *Fruit and Tree Nuts: Trade*. Economic Research Service, United States Department of Agriculture. Available from http://www.ers.usda.gov/topics/crops/fruit-tree-nuts/trade.aspx. Accessed July 30, 2012.

Perez, A., B.-H. Lin, and J. Allshouse. 2001. *Demographic Profile of Apple Consumption in the United States, FTS-292*. Economic Research Service, United States Department of Agriculture.

Perez, A., and S. Pollack. 2003. *Fruit and Tree Nuts Outlook, FTS-302*. Economic Research Service, United States Department of Agriculture.

Perrins, G., and D. Nilsen. 2006. Industry Dynamics in the Washington, DC, Area: Has a Second Job Core Emerged? *Monthly Labor Review* 129 (12):3-20.

Pillsbury, R., and J. Florin. 1996. *Atlas of America Agriculture: The American Cornucopia*. New York: Simon and Schuster MacMillan.

Platou, A. 2010. Land Sales Just Aren't What They Used to Be. *Herald-Mail*. Hagerstown, MD. June 27.

Pollack, A. 2012. That Fresh Look, Genetically Buffed. *The New York Times*. New York, NY. July 12.

Pollack, S., and A. Perez. 2005. Fruit and Tree Nuts Outlook, FTS-315: Economic Research Service, United States Department of Agriculture.

Pollack, S., A. Perez, and K. Plattner. 2010. *Fruit and Tree Nuts Outlook, FTS-341*. Economic Research Service, United States Department of Agriculture.

PRI. 2010. *Disease Resistant Apple Breeding Program: About PRI.* Purdue University, Rutgers University, University of Illinois Disease Resistant Apple Breeding Program. Available from http://www.hort.purdue.edu/newcrop/pri/default.html. Accessed January 12, 2011

Prunty, M. C., and C. S. Aiken. 1972. The Demise of the Piedmont Cotton Region. *Annals of the Association of American Geographers* 62 (2).

Pyle, L. A. 1989. Persistent Landownership at the Rural-Urban Fringe. *Urban Geography* 10 (2):157-171.

Rahelizavatovo, N. C., and J. M. Gillespie. 1999. Dairy Farm Size, Entry, and Exit in a Declining Production Region. *Journal of Agricultural and Applied Economics* 31 (2):333-347.

Raper, A. F., and I. D. A. Reid. 1941. *Sharecroppers All*. Chapel Hill: University of North Carolina Press.

Reany, D. 2002. Area Growers Set to Receive Disappointing Apple Prices. *The Winchester Star*. Winchester, VA. September 12.

Reilly, T. 2005. Building Moratorium is Extended. *Herald-Mail*. Hagerstown, MD. April 13.

Rep. Hinchey (D-NY). 2001. Apple Market Loss Assistance. *Congressional Record* 167 (16):p. 22325.

Rice Fruit Co. 2010a. *About Rice Fruit Company*. Rice Fruit. Available from http://www.ricefruit.com/about_us.html. Accessed February 14, 2012.

ð ð ð . 2010b. *History.* Rice Fruit. Available from http://www.ricefruit.com/history.html. Accessed October 12, 2011.

Rice, J. 2010. Personal Interview - Vice President of Rice Fruit Company, July 8.

Ricks, D., J. Sterns, and T. Woods. 2002. Customer Preferences for Michigan Apples: A Case Example of a Market Research Program for a Commodity Industry. *Journal of Food Distribution Research* 33 (1):125-135.

Ricks, D., T. Woods, and J. Sterns. 2000. Chain Management and Marketing Performance in Fruit Industry. In *Proceedings of the XIVth International Symposium of Horticultural Economics*, ed. J. Ogier, 536: 661-668. Guernsey, UK: Acta Horticulturae.

Rinehart, J. D. 2009. *JD Rinehart Part 1 (video)*. YouTube. Available from http://www.youtube.com/watch?v=If0RBExye44. Accessed February 13, 2012.

Rinker Orchards. 2011. *Rinker's Apple Cider*. Rinker Orchards. Available from http://www.rinkerorchards.com/cider.html. Accessed April 15, 2012.

Rivers, T. 2010. Future is Seen in Fruit. *The Daily News*. Batavia, NY. August 6.

Robinson, T. 2005. Should New York Apple Growers Move Up to Higher Tree Densities? (Part 1). *New York Fruit Quarterly* 13 (1):27-31.

Robinson, T., and S. A. Hoying. 2001. Processing Apple Planting Systems Trials. *New York Fruit Quarterly* 9 (4):16-19.

Robinson, T., S. A. Hoying, A. DeMaree, K. Iungerman, and M. Fargione. 2007. The Evolution Towards More Competitive Apple Orchard Systems in New York. *New York Fruit Quarterly* 15 (1):3-9.

Rogers, E. M. 1983. *Diffusion of Innovations*. 3rd ed. New York: The Free Press.

Rollins, H. A., Jr. 1970. York Imperial. In *North American Apples: Varieties, Rootstocks, Outlooks*, ed. W. H. Upshall, 146-152. East Lansing, MI: Michigan State University Press.

Rom, C., and S. Ela. 2005. *Organic Apple Thinning Strategies*. Organic Farming Research Foundation. Available from http://ofrf.org/funded/reports/rom_02s10.pdf Accessed February 09, 2011.

Rose, G. 1997. Situating Knowledges: Positionality, Reflexivities, and Other Tactics. *Progress in Human Geography* 21 (3):305-320.

Rose, S., and S. Hiller. 2007. From Migrant Work to Community Transformation: Families Forming Transnational Communities in Periban and Pennsylvania. *Oral History Review* 34 (1):97-144.

Rosenberger, D., J. Schupp, C. Watkins, K. Iungerman, S. A. Hoying, D. Straub, and L. Cheng. 2001. Honeycrisp: Promising Profit Maker or Just Another Problem Child. *New York Fruit Quarterly* 9 (3):4-8.

Roth, M. 1999. Overview of Farm Direct Marketing Industry Trends. Paper read at Agricultural Outlook Forum, at Arlington, Virginia.

Rowles, K. 2001a. Industry Analysis: Apple Processors in the Northeastern U.S., SP 2001-02. Ithaca, NY: Cornell University, http://hortmgt.dyson.cornell.edu/pdf/resources/sp2001-02.pdf

ð ð ð . 2001b. *Processed Apple Product Marketing Analysis: Apple Juice & Cider, SP 2001-01*. Ithaca, NY: Cornell University, http://hortmgt.dyson.cornell.edu/pdf/resources/sp2001-01.pdf

Rowles, K., B. M. Henehan, and G. B. White. 2001. *Thinking Afresh About Processing: An Exploration of New Market Opportunities for Apple Products, SP 2001-03*. Ithaca, NY: Cornell University, http://hortmgt.dyson.cornell.edu/pdf/resources/sp2001-03.pdf

Sacks, H. L. 2010. Why Aren't There Any Turkeys at the Danville Turkey Festival? *Journal of Agriculture, Food Systems, and Community Development* 1 (1):1-7.

Sazo, M. M., A. De Marree, and T. Robinson. 2010. The Platform Factor - Labor Positioning Machines Producing Good Results for NY Apple Industry. *New York Fruit Quarterly* 18 (2):5-9.

Schotzko, R. T. 2004. *A Brief Look at the Washington Apple Industry: Past and Present, SES 04-05*. Washington State University.

Schrecongost, A. 1999. The Changing Nature of Migrant Farm Labor: A Case Study of West Virginia's Apple Industry, Research Paper 9913. Morgantown, WV, West Virginia University http://rri.wvu.edu/wp-content/uploads/2011/04/REU9913.pdf

Schupp, J. 2010. Honeycrisp - Past, Present, and Future. *Fruit Times* 29 (2):1-3.

ð ð ð . 2011. Preventing Alternate Bearing in Fruit Crops. *Fruit Times* 30 (2):1-5.

Schupp, J., T. Baugher, and R. M. Crassweller. 2011. The Orchard System Blueprint. In *Specialty Crop Innovations Progress Report*, ed. T. Baugher: Penn State Fruit Research and Extension Center, Adams County.

Semler, J. 2010. Personal Interview - Senior Agent, University of Maryland Extension, Washington County, June 23.

Shabecoff, P. 1990. Apple Scare of '89 Didn't Kill Market. *The New York Times*. New York, NY. November 13.

Shanholtz, G. 2010. Personal Interview - Fruit Grower, June 24.

SHAP. 2012. *About Us*. State Horticultural Association of Pennsylvania. Available from http://shaponline.org/?page_id=2. Accessed March 30, 2012.

Shih, T.-H., and X. Fan. 2008. Comparing Response Rates from Web and Mail Surveys: A Meta-Analysis. *Field Methods* 20 (3):249-271.

Shumway, J. M., and S. M. Otterstrom. 2001. Spatial Patterns of Migration and Income Changes in the Mountain West: The Dominance of Service-Based, Amenity-Rich Counties. *Professional Geographer* 53 (4):492-502.

Simon, H. A. 1957. *Models of Man: Social and Rational*. New York: John Wiley and Sons.

Sinclair, R. 1967. Von Thunen and Urban Sprawl. *Annals of the Association of American Geographers* 57 (1):72-87.

Siyu, Z., and C. Xiao. 2010. *US Lifts Tariffs on Apple Juice Concentrates*. China Daily Clips. Available from http://www.cdeclips.com/en/business/US_lifts_tariffs_on_apple_juice_concentrates/fullstory_55374.html. Accessed October 12, 2011.

Slavin, R. 2004. Subdivision Plans Ok'd. *The Journal*, Martinsburg, WV, May 25.

Smithers, J., and P. Johnson. 2004. The Dynamics of Family Farming in North Huron County, Ontario. Part 1. Development Trajectories. *The Canadian Geographer* 48 (2):191-208.

Smock, R. M., and A. M. Neubert. 1950. *Apples and Apple Products*. New York City: Interscience Publishers Inc.

Smoot, E. 2011. What's the Deal with all These Stinkbugs? *The Northern Virginia Daily*. Strasburg, VA. April 29.

Smoot, N. 2007. Land Slated for Development. *The Journal*. Martinsburg, WV. July 25.

ð ð ð . 2008a. Age-Old Industry Gets New Spin. *The Journal*. Martinsburg, WV. August 10.

ð ð ð . 2008b. More Visiting Farmers Markets. *The Journal*. Martinsburg, WV. August 17.

Snyder, R. 2005. Autumn of an Industry. *The Journal*. Martinsburg, WV. October 18.

Sokolow, A. D. 2003. California's Edge Problem: Urban Impacts on Agriculture. In *California Agriculture Dimensions and Issues*, ed. J. Siebert, 289-304. Davis: University of California Giannini Foundation of Agricultural Economics.

Sokolowski, J. L. 2002a. Apple Season Draws Influx of Migrants to the Orchards. *The Winchester Star*. Winchester, VA. September 4.

ð ð ð . 2002b. Long Drought, Low Prices Plague Area Apple Growers. *The Winchester Star*. Winchester, VA. October 9.

Sollenberger, E., and L. Kammerer. 2007. Spotlight on Agriculture: An Apple a Day Keeps the Doc Away. *Gettysburg Times*. Gettysburg, PA. July 5.

Sonnenfeld, D., R. T. Schotzko, and R. A. Jussaume Jr. 1998. Globalization of the Washington Apple Industry: Its Evolution and Impacts. *International Journal of Sociology of Agriculture and Food* 7:151-180.

Source 1027. 2010. Personal Communication - Fruit Grower.

Source 1028. 2010. Personal Communication - Fruit Grower.

Source 1065. 2010. Personal Communication - Fruit Grower.

Source 1069. 2010. Personal Communication - Fruit Grower.

Source 1082. 2010. Personal Communication - Fruit Grower.

Source 1089. 2010. Personal Communication - Fruit Grower.

Source 1091. 2010. Personal Communication - Fruit Grower.

Source 1103. 2010. Personal Interview - Fruit Grower, June 18.

Source 1111. 2010. Personal Communication - Fruit Grower.

Source 1241. 2010. Personal Communication - Fruit Grower.

Source 2210. 2010. Personal Communication - Former Fruit Grower.

Source 3170. 2004. Personal Interview - Former Apple Grower, April 27.

Source 3182. 2010. Personal Communication - Former Apple Grower.

Source 3199. 2010. Personal Interview - Fruit Grower, June 24.

Source 3224. 2010. Personal Communication - Fruit Grower.

Source 3226. 2010. Personal Communication - Apple Grower.

Source 4128. 2010. Personal Communication - Apple Grower.

Source 5001. 2010. Personal Communication - Fruit Grower, July 2.

Source 5003. 2010. Personal Communication - Fruit Tree Expert.

Source 5006. 2010. Personal Communication - Fruit Industry Expert.

Sparks, B. 2004. Virginia Apples Go Global. *American/Western Fruit Grower* 124 (10).

ð ð ð . 2012. *Building Pennsylvania Orchards for the Future*. American/Western Fruit Grower. Available from http://www.growingproduce.com/article/26604/building-pennsylvania-orchards-for-the-future. Accessed May 2, 2012.

Sparks, B., D. Eddy, and M. Oster. 2008. Counting Costs. *American/Western Fruit Grower* 128 (9).

SSCC. 2011. *Shawnee Canning Co.* Shawnee Springs Canning Company. Available from http://www.shawneesprings.com/Cannery.html. Accessed April 15, 2012

Stam, J. M., and B. L. Dixon. 2004. *Farmer Bankruptcies and Farm Exits in the United States, 1899-2002, AIB-788.* Economic Research Service, United States Department of Agriculture.

Stellhorn, A. 2011. *Stink Bug Numbers Show Overall Decline*. Lancaster Farming. Available from http://lancasterfarming.com/news/southeedition/Stink-Bug-Numbers-Show-Overall-Decline-. Accesed July 27, 2012.

Stern, R. 2008. The Devil is in the Details. The Packer. http://www.thepacker.com/commodity-fruits/peaches/the_devil_is_in_the_details_117878699.html Accessed July 30, 2012.

Steward, P. 2008. Concentrate Imports Rise. *Good Fruit Grower* 59 (1).

Swain, C. M. 2010. *Testimony of Dr. Carol M. Swain for the House Judiciary Committee's Subcommittee on Immigration, Refugees, and Border Security, September 24, 2010*. United States House of Representatives, Committee on Judiciary. Available from http://judiciary.house.gov/hearings/pdf/Swain100924.pdf Accessed August 16, 2011

Ten Eyck, P. 2006. Will I Be Able to Plant the Next Great Apple? The New Paradigm in Apple Varieties. *New York Fruit Quarterly* 14 (2):13-15.

Thompson, A. A. 1993. Spray Thinning - A 20th Century Innovation. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 48-49. Charles Town, WV: Lowman Printing Company.

Torres, C. 2010. *Cold Storage Taps Trend Towards Fresh Market Apples*. Lancaster Farming. Available from http://www.lancasterfarming.com/Cold-Storage-Taps-Trend-Toward-Fresh-Market-Apples. Accessed April 9, 2012.

Tree Top Inc. 2010. *Low Moisture Infused Apples* Tree Top. Available from http://www.treetop.com/Ingredients/ProductDetail.aspx?CategoryID=363&ProductID=250&SubCategoryID=402. Accessed March 14, 2011.

Tropp, D., E. Ragland, and J. Barham. 2008. *Supply Chain Basics: The Dynamics of Change in the U.S. Food Marketing Environment, Agriculture Handbook 728-3.* Agricultural Marketing Service, United States Department of Agriculture.

Turkey Knob Apples. 2009. *Our History/Orchards*. Turkey Knob Apples. Available from http://turkeyknobapples.com/about-us/our-history-orchards.html?SID=6c4j19kd9j28g7duug3n8vfvh0. Accessed February 15, 2012.

U.S. Apple Association. 2001. *All About Apples: Apple Storage Technologies*. Available from http://usapple.org/AppleStorageTechnologies.html. Accessed February 22, 2011.

ð ð ð . 2007. USDA to Purchase Apple Products. *Apple News* 37 (9).

ð ð ð . 2010a. APHIS Hands Pest List to China, Creating Possibility for Future Chinese Imports. *Apple News* 41 (9):1.

ð ð ð . 2010b. Checking the Books: US Apple's Financial Overview. *Apple News* 41 (9):8.

ð ð ð . 2010c. USApple Leads Attack on Devastating Brown Marmorated Stink Bug. *Apple News* 41 (9):3.

ð ð ð . 2011. *Losses to Mid-Atlantic Apple Growers at $37 Million to Brown Marmorated Stink Bug*. U.S. Apple Association. Available from http://www.usapple.org/PDF/Media/BMSBDamageMidAtlantic.pdf Accessed July 27, 2012

.

ð ð ð . 2012a. *Agricultural Labor Reform*. U.S. Apple Association. Available from http://www.usapple.org/PDF/Govt_Affairs/Agriculture%20Labor.pdf Accessed July 30, 2012.

ð ð ð . 2012b. *Legislative Priorities*. U.S. Apple Association. Available from http://www.usapple.org/government/legislative-priorities

U.S. Census Bureau. 2003. *County-to-County Worker Flow Files*. Available from http://www.census.gov/population/www/cen2000/commuting/index.html. Accessed March 20, 2012

ð ð ð . 2007. *County Population Census Counts 1900-90*, Jan. 18, 2007. Available from www.census.gov/population/www/censusdata/cencounts.html. Accessed May 6, 2008.

ð ð ð . 2008. *State and County Quickfacts* . Available from quickfacts.census.gov/qfd/index.htm. Accessed May 6, 2008

ð ð ð . 2011. *American Fact Finder: Census 2010*. Available from http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed May 13, 2011

Umstead, M. 2008. Berkeley County Voters Reject Zoning by Nearly 2-to-1 Margin. *Herald-Mail*. Hagerstown, MD. May 14.

University of Maryland. 2011. *Jim Hanson*. Department of Agricultural and Resource Economics. Available from http://www.arec.umd.edu/people/faculty/Conversations/highlights2.cfm.

Upshall, W. H. ed. 1970. *North American Apples: Varieties, Rootstocks Outlook*. East Lansing, MI: Michigan State University Press.

USAEC. 2010. *Welcome to the United States Apple Export Council*. United States Apple Export Council. Available from http://www.usaapples.com/en/index.html. Accessed July 29, 2012.

USDA AMS. 2010a. *AMS Programs*. Agricultural Marketing Service, United States Department of Agriculture. Available from http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateN&navID=FindanAMSProgram&rightNav1=FindanAMSProgram&topNav=Home&leftNav=&page=FindanAMSProgram&resultType=&acct=AMSPW. Accessed November 23, 2010.

ð ð ð . 2010b. *Farmers Markets and Local Food Marketing: Farmers Market Growth: 1994-2010*. Agricultural Marketing Service, United States Department of Agriculture. Available from http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateS&navID=WholesaleandFarmersMarkets&leftNav=WholesaleandFarmersMarkets&page=WFMFarmersMarketGrowth&description=Farmers%20Market%20Growth&acct=frmrdirmkt. Accessed April 21, 2011.

ð ð ð . 2011. *Fresh Produce Audit Verification Program*. Agricultural Marketing Service, United States Department of Agriculture. Available from http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateN&page=GAPGHPAuditVerificationProgram. Accessed January 11, 2011.

USDA ERS. 2009. *Farm and Commodity Policy: Program Provisions: Natural Disaster and Emergency Assistance Programs*. Economic Research Service, United States Department of Agriculture. Available from http://www.ers.usda.gov/Briefing/FarmPolicy/disaster.htm. Accessed January 8, 2011.

ð ð ð . 2010a. *Fruit and Tree Nuts Situation and Outlook Yearbook 2010, FTS-2010*. Economic Research Service, United States Department of Agriculture. Available from http://www.ers.usda.gov/Publications/FTS/Yearbook10/FTS2010.pdf. Accessed July 7, 2011

ð ð ð . 2010b. *U.S. Apple Statistics*. Economic Research Service, United States Department of Agriculture. Available from http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1825. Accessed June 20, 2011.

USDA FAS. 2011. *Fact Sheet: Market Access Program*. Foreign Agricultural Service, United States Department of Agriculture. Available from http://www.fas.usda.gov/info/factsheets/MAP.asp. Accessed July 29, 2012.

USDA NASS. 2004. *2004 West Virginia Orchard & Vineyard Survey*. West Virginia Field Office, National Agricultural Statistics Office, United States Department of Agriculture. Available from http://www.nass.usda.gov/Statistics_by_State/West_Virginia/Publications/Orchard_&_Vineyard_Survey/TOC-O&V2005.htm. Accessed July 1, 2011.

ð ð ð . 2005. *2005 Virginia Orchard Survey*. Virginia Field Office, National Agricultural Statistics Service, United States Department of Agriculture. Available from http://www.nass.usda.gov/Statistics_by_State/Virginia/Publications/2005fruitpub.pdf Accessed July 1, 2011.

ð ð ð . 2006. *Washington Fruit Survey 2006*. Washington Field Office, National Agricultural Statistics Service, United States Department of Agriculture. Available from http://www.nass.usda.gov/Statistics_by_State/Washington/Publications/Fruit/FruitTreeInventory2006.pdf Accessed May 18, 2011.

ð ð ð . 2007a. *Fruit Rotational Survey, 2006-2007*. Michigan Field Office, National Agricultural Statistics Service, United States Department of Agriculture. Available from http://www.nass.usda.gov/Statistics_by_State/Michigan/Publications/Michigan_Rotational_Surveys/mi_fruit07/fruit.html. Accessed May 30, 2011.

ð ð ð . 2007b. *New York Fruit Tree and Vineyard Survey 2006*. New York Field Office, National Agricultural Statistics Service, United States Department of Agriculture. Available from http://www.nass.usda.gov/Statistics_by_State/New_York/Publications/Special_Surveys/FruitTree/Fruit%20Tree%202006Revised.pdf Accessed May 22, 2011.

ð ð ð . 2007c.*Noncitrus Fruits and Nuts 2006 Summary, Fr Nt 1-3 (07)*. National Agricultural Statistics Service, United States Department of Agriculture. Available from http://usda.mannlib.cornell.edu/usda/nass/NoncFruiNu//2000s/2007/NoncFruiNu-07-06-2007.pdf Accessed August 28, 2011.

ð ð ð . 2008. *Pennsylvania's Orchard and Vineyard Statistics 2008*. Pennsylvania Field Office, National Agricultural Statistics Service, United States Department of Agriculture. Available from http://www.nass.usda.gov/Statistics_by_State/Pennsylvania/Publications/Orchard_and_Vineyard/2008/Final%20OV%20Release_06-09-2010.pdf Accessed July 1, 2011.

ð ð ð . 2009a. *1982, 1987, 1992, 1997, 2002, and 2007 Census of Agriculture*. Washington, D.C.: National Agricultural Statistics Service, United States Department of Agriculture, Government Publishing Office.

ð ð ð . 2009b. *2007 Census of Agriculture*. Washington, D. C.: National Agricultural Statistics Service, United States Department of Agriculture, Government Publishing Office.

ð ð ð . 2009c. *2007 Census Publications: State and County Profiles*. National Agricultural Statistics Service, United States Department of Agriculture 2009. Available from http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/index.asp. Accessed February 13, 2012.

ð ð ð . 2010a. 2008 Organic Production Survey: National Agricultural Statistics Service, United States Department of Agriculture.

ð ð ð . 2010b. *New York Agricultural Statistics: Annual Bulletin 2009-2010*. New York Field Office, National Agricultural Statistics Service, United States Department of Agriculture. Available from http://www.nass.usda.gov/Statistics_by_State/New_York/Publications/Annual_Statistical_Bulletin/2010/bulletin2010.pdf Accessed May 20, 2011.

ð ð ð . 2010c. *Noncitrus Fruits and Nuts 2009 Summary, Fr Nt 1-3 (10)*. National Agricultural Statistics Service, United States Department of Agriculture. Available from http://usda.mannlib.cornell.edu/usda/nass/NoncFruiNu//2010s/2010/NoncFruiNu-07-07-2010.pdf Accessed August 28, 2011.

ð ð ð . 2011. *Washington Tree Fruit Acreage Report 2011*. Washington Field Office, National Agricultural Statistics Service, United States Department of Agriculture. Available from http://www.nass.usda.gov/Statistics_by_State/Washington/Publications/Fruit/FruitTreeInventory2011.pdf Accessed February 3, 2012.

USDA SRS. 1976. *Noncitrus Fruits and Nuts: Midyear Supplement, Production, Use, & Value, Fr Nt 1-3 (76)*. Statistical Reporting Service, United States Department of Agriculture. Available from http://usda.mannlib.cornell.edu/usda/nass/NoncFruiNu//1970s/1976/NoncFruiNu-07-00-1976.pdf Accessed August 28, 2011.

ð ð ð . 1984a. *1982 Census of Agriculture*. Washington, D.C.: Statistical Reporting Service, United States Department of Agriculture, Government Printing Office.

ð ð ð . 1984b. *Noncitrus Fruits and Nuts: 1983 Midyear Supplement, Fr Nt 1-3 (7-84)*. Statistical Reporting Service, United States Department of Agriculture. Available from http://usda.mannlib.cornell.edu/usda/nass/NoncFruiNu//1980s/1984/NoncFruiNu-07-05-1984.pdf Accessed August 28, 2011.

Vaden, H. 2009. *A...is for Adaptable: Cold Storage Facilities Forced to Diversify as Valley's Apple Share Shrink*. Shenandoah.com. Available from http://www.shenandoah.com/stories/?id=5645. Accessed February 15, 2012.

VAGA. 2011. *Local Virginia Apples*. Virginia Apple Growers Association. Available from http://www.virginiaapples.org/index.html. Accessed March 30, 2012.

Van Meter, V. 2003. Growers Eliminate Voluntary Apple Tax. *The Winchester Star*. Winchester, VA. February 21.

ð ð ð . 2010. Virginia Apple Growers Battle Weather, Stink Bugs. *The Winchester Star*. Winchester, VA. November 8.

van Voorthuizen, H. 2001. An Economic Evaluation of the Washington Apple Industry's Advertising and Promotion Programs. Dissertation, Department of Agricultural Economics, Washington State University, Pullman, WA.

van Voorthuizen, H., S.-Y. Cho, R. T. Schotzko, and R. Mittelhammer. 2001. The Apple Juice Concentrate Anti-Dumping Case Against China: An Estimate of Change in Washington's Revenues. *Journal of Food Distribution Research* 32 (1):188-196.

VDACS. 2012. *Virginia Farm to School Week*. Virginia Department of Agriculture and Consumer Services. Available from http://www.vdacs.virginia.gov/marketing/farm.shtml. Accessed March 28, 2012.

Veeck, G., D. Che, and A. Veeck. 2006. America's Changing Farmscape: A Study of Agricultural Tourism in Michigan. *Professional Geographer* 58 (3):235-248.

Vossen, P. 1998. *Marketing Organic Apples Successfully*. University of California Cooperative Extension. Available from http://sfp.ucdavis.edu/pubs/SFNews/Spring98/apples.html. Accessed February 9, 2010.

WAC. 2010a. *About the Apple Commission*. Washington Apple Commission. Available from http://www.bestapples.com/about/index.aspx. Accessed January 20, 2011.

ð ð ð . 2010b. *Controlled Atmospheric Storage (CA)*. Washington Apple Commission. Available from http://www.bestapples.com/facts/facts_controlled.aspx. Accessed May 20, 2011.

ð ð ð . 2010c. *Integrated Pest Management (IPM)*. Washington Apple Commission. Available from http://www.bestapples.com/varieties/varieties_ipm.aspx. Accessed May 20, 2011.

ð ð ð . 2010d. *Washington Grades More Stringent*. Washington Apple Commission. Available from http://www.bestapples.com/facts/facts_grades2.aspx. Accessed February 24, 2011.

Walton, J. C., D. M. Lambert, R. K. Roberts, J. A. Larson, B. C. English, S. L. Larkin, S. W. Martin, M. C. Marra, K. W. Paxton, and J. M. Reeves. 2008. Adoption and Abandonment of Precision Soil Sampling in Cotton Production. *Journal of Agricultural and Resource Economics* 33 (3):428-448.

Warner, G. 2005a. *A Different Perspective on China*. Good Fruit Grower, 56 (5). Available from http://www.goodfruit.com/Good-Fruit-Grower/March-1st-2005/A-different-perspective-on-China/. Accessed October 12, 2011.

ð ð ð . 2005b. *Shaanxi Apple Region Impresses*. Good Fruit Grower, 56 (14). Available from http://www.goodfruit.com/Good-Fruit-Grower/September-2005/Shaanxi-apple-region-impresses/. Accessed October 12, 2011.

ð ð ð . 2006. Wal-Mart Wants Regional Fruit. *Good Fruit Grower* 57 (9):28.

ð ð ð . 2009a. Market Limitations: What's the Future for Club Varieties? *Good Fruit Grower* 60 (17):28-29.

ð ð ð . 2009b. Should WAC Come Back? *Good Fruit Grower* 60 (17):32.

ð ð ð . 2010a. How to Choose the Variety. *Good Fruit Grower* 61 (1):14-15.

ð ð ð . 2010b. Strategies for Success. *Good Fruit Grower* 61 (1):10-11.

ð ð ð . 2011a. *Picker and Sorter*. Good Fruit Grower, 62 (16). Available from http://www.goodfruit.com/Good-Fruit-Grower/November-2011/Picker-and-sorter/. Accessed February 8, 2012.

ð ð ð . 2011b. *Platforms Not Widely Used*. Good Fruit Grower, 62 (17). Available from http://www.goodfruit.com/Good-Fruit-Grower/December-2011/Platforms-not-widely-used/. Accessed February 8, 2012.

ð ð ð . 2011c. *So, Does it Bruise the Fruit?* Good Fruit Grower, 62 (16). Available from http://www.goodfruit.com/Good-Fruit-Grower/November-2011/So-does-it-bruise-the-fruit/. Accessed February 8, 2012.

ð ð ð . 2012a. The Rise and Power of a Brand. *Good Fruit Grower* 63 (5):20-22.

ð ð ð . 2012b. *Stinkbug Poses Big Threat*. Good Fruit Grower 63 (5). Available from http://www.goodfruit.com/Good-Fruit-Grower/March-1st-2012/Stinkbug-poses-BIG-THREAT/. Accessed July 27, 2012.

Warner, G., and M. Hansen. 2010. *Is Redder Better?* Good Fruit Grower, 61 (2). Available from http://www.goodfruit.com/Good-Fruit-Grower/January-15th-2010/Is-redder-better/. Accessed February 21, 2012.

Weinraub, J. 2005. Buy Fruit, Save a Farm. *The Washington Post*. Washington, DC. August 3.

Wenk, B. 2010. Personal Interview - Fruit Grower, July 8.

WFCEDC. 2011. *Major Employers*. Winchester-Frederick County Economic Development Commission. Available from http://winva.com/wp-content/uploads/2011/11/FactSheets_Employers_All.pdf Accessed March 20, 2012.

Wheat, D. 2012 *Sliced Apple Sales Gain Momentum*. Capital Press. Available from http://www.capitalpress.com/mobile/djw-appleslices-w-art-122311. Accessed March 25, 2012.

Wheeler, J. O., P. O. Muller, G. I. Thrall, and T. J. Fik. 1998. *Economic Geography*. 3rd ed. New York: John Wiley & Sons, Inc.

White, C. 2009. *Organic Apple Production is Possible with Management Techniques that Apple to all Orchardists*. Penn State Extension. Available from http://extension.psu.edu/susag/news/archives/2009/10/6organicapple. Accessed March 27, 2012.

White, G. B. 2000. Trends in Apple Marketing and Impacts on NY Growers' Profitability.
New York Fruit Quarterly 8 (2):2-7.

Whoriskey, P. 2004a. Space for Employers, Not for Homes. *Washington Post*. Washington, DC. August 8:A01.

ð ð ð . 2004b. Washington's Road to Outward Growth. *Washington Post.* Washington, DC. August 9:A01.

Wilhelm, S. 2010. *Tree Top Presses on with Strategy for Adding Products*. Puget Sound Business Journal. Available from http://www.bizjournals.com/seattle/stories/2010/06/21/focus3.html. Accessed March 26, 2011.

Wilkinson, A. E. 1915. *The Apple: A Practical Treatise Dealing with the Latest Modern Practices of Apple Culture*. Boston, MA: Ginn and Company.

Williams, J. A. 2002. *Appalachia: A History*. Chapel Hill: The University of North Carolina Press.

Williams, S. 2012. *New Sizer, Other Equipment Working for Hess Brothers*. Fruit Grower News, 51 (1). Available from http://fruitgrowersnews.com/index.php/magazine/article/new-sizer-other-equipment-working-for-hess-brothers. Accessed July 9, 2012.

Wilmot, E., H. H. Chouinard, J. K. Yoder, and R. T. Schotzko. 2008. Effects of Generic Advertisement on Demand: The Case of the Washington State Apple Commission. *Journal of Food Distribution Research* 39 (2):40-49.

Winsberg, M. D. 1997. The Great Southern Agricultural Transformation and its Social Consequenses. *Southeastern Geographer* 37 (2):193-213.

Withers, L. B. 2005. Declining Apple Prices Mean "It's Decision Time:" Orchardists Forced to Consider the Future. *The Winchester Star*. Winchester, VA. Oct. 12.

Wolpert, J. 1964. The Decision Process in Spatial Context. *Annals of the Association of American Geographers* 54 (4):537-558.

Wolpert, J., and M. N. Danielson. 1991. The Rural Fringe in the New Metropolis. In *National Rural Studies Committee. A Proceedings (Reading, Pennsylvania May 16-17)*, eds. E. N. Castle and B. Baldwin, 33-46. Corvallis, OR: Oregon State University.

Yockey, D. 2008. *Many Michigan Growers Plan to Increase Apple Acreage*. Michigan Apple Committee. Available from http://www.michiganapples.com/many-michigan-growers-plan-to-increase-apple-acreage.html. Accessed May 31, 2011.

Young, R. S. 1993. National Peach Council. In *One Hundred Years...West Virginia State Horticultural Society*, ed. N. Miller, 34-35. Charles Town, WV: Lowman Printing Company.

Zarrugh, L. 2008. The Latinization of the Central Shenandoah Valley. *International Migration* 46 (1):19-58.

Zollinger, B., and R. S. Krannich. 2002. Factors Influencing Farmers' Expectations to Sell Agricultural Land for Non-Agricultural Uses. *Rural Sociology* 67 (3):442-463.

APPENDIX ONE: THE MAIL SURVEY

Mid-Atlantic Apple Survey

A Survey for Current and Former Apple Growers



THE UNIVERSITY of TENNESSEE KNOXVILLE

This survey is designed to gain insights into the changes that are occurring in the apple-growing region that stretches from south central Pennsylvania to the northern Shenandoah Valley of Virginia.

If possible, I would like the orchardôs primary decision maker to fill out the survey.

PART I. These questions are about your current farm.

1. **Did you produce apples in 2009?**
   - ❑ Yes
   - ❑ No

   If you selected "No," please answer the remaining questions based on the last few years that you were still in operation.

2. **Approximately, how many total acres do you have planted in…**

   _____ Apples

   _____ Other fruit

   _____ Other crops

3. **Currently, do you…**

Have a retail outlet on your farm	❑ Yes	❑ No
Offer entertainment options such as tours, hayrides	❑ Yes	❑ No
Offer a pick-your-own option for customers	❑ Yes	❑ No
Sell at farmers markets	❑ Yes	❑ No
Advertise your products to the general public	❑ Yes	❑ No
Have a Controlled Atmosphere (CA) storage facility	❑ Yes	❑ No

4. **Do you grow any trademarked "club varieties?" Examples – American Cameo, Pink Lady, Jazz…**
   - ❑ Yes
   - ❑ No

   If you selected "Yes," which varieties _____

5. **Approximately what percentage of your crop do you sell to the following:**

   _____ Fresh market wholesale or to a grocery store

   _____ Retail on farm, farmers market, or other direct marketing outlet

   _____ Processors

6. **Do you produce apples specifically for the processing market (not just your fresh market culls and low grades)?**
   - ❑ Yes
   - ❑ No

7. **If you sell apples at a farmers market, how much time does it take for you to drive from your farm to each farmers market that you attend? List drive times for each market.**

   _____

   _____

PART II. These questions deal with factors that may influence the decision to leave the apple-growing business.

8. **Who do you feel is your main source of competition? Check only one**
   - ❑ Other growers in your region
   - ❑ Growers from other regions in the eastern United States
   - ❑ Washington State
   - ❑ Foreign apples and apple products

9. Please indicate whether or not the following statements are true about your farm.

I have trouble finding enough labor for my farm	❑ Yes	❑ No
Most manual labor on my farm is done by migrant labor	❑ Yes	❑ No
Local workers are an important source of labor	❑ Yes	❑ No
The H-2A program is an important source of labor	❑ Yes	❑ No

10. Please indicate the degree of difficulty your business operation has had coping with the following challenges facing the local apple industry.

	No problem				Extreme difficulties
Difficulties in obtaining labor	❑	❑	❑	❑	❑
Inability to expand production through purchase or renting of land	❑	❑	❑	❑	❑
Managing your debt load	❑	❑	❑	❑	❑
Government regulations/red tape	❑	❑	❑	❑	❑
Moving to high-density plantings and less labor intensive production	❑	❑	❑	❑	❑
Difficulty obtaining grocery store shelf space	❑	❑	❑	❑	❑
Foreign concentrate and other apple product imports	❑	❑	❑	❑	❑

11. Please rate the level of importance the following factors are likely to have in terms of your decision to stop growing apples.					
	Not Important				Very Important
Low apple prices	❑	❑	❑	❑	❑
Rising cost of expenses ï fuel, pesticides, equipmenté	❑	❑	❑	❑	❑
Ability to sell land for high price	❑	❑	❑	❑	❑
Difficulties in obtaining labor at affordable rate	❑	❑	❑	❑	❑
Government regulations/red tape	❑	❑	❑	❑	❑
Other employment opportunities for you	❑	❑	❑	❑	❑
Competition from other growers	❑	❑	❑	❑	❑
Son/daughter not interested in farming	❑	❑	❑	❑	❑
Retirement	❑	❑	❑	❑	❑
Inability to expand farm through purchase or rental of land	❑	❑	❑	❑	❑
Debt load or difficulties obtaining financing	❑	❑	❑	❑	❑
Continue farming but switch to other crops	❑	❑	❑	❑	❑

12. Rank the following statements based on their likely importance in your decision to leave agriculture. Use each number only once. (1 = most important, 2 = 2nd most important…5 = least important)

_____ Retirement

_____ Difficulty in obtaining labor at an affordable rate

_____ Other employment opportunities

_____ Low annual rate of return on investment (low apple prices, high expenses)

_____ Ability to sell land at a high price

13. How important is maintaining your lifestyle of working on the farm?

- ❑ Very important
- ❑ Somewhat important
- ❑ Neutral
- ❑ Not important

14. Are you generally optimistic or pessimistic about the future of apple-growing in your area?

- ❑ Very optimistic
- ❑ Somewhat optimistic
- ❑ Neutral
- ❑ Somewhat pessimistic
- ❑ Very pessimistic

15. Describe the interactions you have with other growers in the following states… Check all that apply.

	PA	**MD**	**WV**	**VA**
Social relationships	❑	❑	❑	❑
Business relationships	❑	❑	❑	❑
Little to no contact	❑	❑	❑	❑

16. In the past 15 years, development pressure (increase in local population, rising land values, new residential or commercial projects) in your area has been…

- ❑ High
- ❑ Medium
- ❑ Low

17. How has development in your area impacted your business? Check all that apply.

- ❑ Makes it difficult to purchase new land
- ❑ Affects decision whether to replant or not
- ❑ Increases equity in the farm ï easier to obtain loans if needed
- ❑ Increases likelihood of selling the farm
- ❑ Increases retail sales on farm

18. If you lease land from others, how concerned are you in maintaining long-term access to that land parcel?

- ❑ Very concerned
- ❑ Somewhat concerned
- ❑ Not concerned ï I have a stable, long-term agreement
- ❑ Not concerned ï I can easily rent land elsewhere
- ❑ I do not rent land from others

19. If you stopped growing fruit in the future or if you have already decreased your fruit acreage, would you consider shifting to a different type of agriculture?

- ❑ Yes
- ❑ No

If Yes, check the items you would consider growing.

❑ Corn, soybean, wheat ❑ Vegetables ❑ Dairy
❑ Beef cattle ❑ Horses ❑ Hay or pasture ❑ Other

20. If you decide to sell your farm in the future, what is the likelihood that the land would continue to be used for agriculture?

- ❑ Highly likely
- ❑ Unsure
- ❑ Not likely

21. If you decide to sell your current farm in the future, what is the likelihood that you would establish another apple orchard?

- ❑ Highly likely
- ❑ Unsure
- ❑ Not likely

22. If you are a former grower or a current grower who has sold a significant amount of land, what was the land used for after it was sold? Check all that apply.

- ❑ Orchards
- ❑ Corn or other crop
- ❑ Hay or pasture
- ❑ Beef cattle
- ❑ Vacant
- ❑ Housing
- ❑ Commercial use

23. Do you expect a son, daughter, other relative, or close associate to eventually take over the operations of your farm?

- ❑ Yes
- ❑ No
- ❑ Unsure

24. How has the current financial crisis influenced your decision-making? Check all that apply.

- ❑ Obtaining financing is more difficult
- ❑ I have delayed planned improvements ï new buildings, equipmenté
- ❑ I am more likely to sell land
- ❑ I am less likely to sell land
- ❑ I will increase my production of apples
- ❑ It has improved local retail sales of apples
- ❑ The financial crisis has not had a major impact on my business

PART III. This final section focuses on the changes that you have made or expect to make to your apple-growing operation. If you are a **former grower**, skip ahead to question number 31.

25. In the next 5 years, do you expect to…

- ❑ Increase apple acreage
- ❑ Maintain present level of operations
- ❑ Decrease apple acreage

26. In the next 5 years, do you expect to make any of the following capital improvements? (Check all that apply)

- ❑ Plant or replant apple acreage
- ❑ Increase the density of plantings (more trees per acre)
- ❑ Purchase expensive farm machinery
- ❑ Buy or construct farm-related buildings

27. In the next 5 years, do you expect to… (Check all that apply)

- ❑ Sell your farm
- ❑ Sell some of your land
- ❑ Exit active farming but rent your land to another grower
- ❑ Stop growing apples but continue farming
- ❑ None of the above

28. In the next 5 years, would you consider selling your operation…

- ❑ I am actively trying to sell now or considering offers
- ❑ Only if I get the right offer
- ❑ Only at last resort
- ❑ Not at all

29. In the next 5 years, do you expect your farm to be profitable (positive cash flow)…

- ❑ All 5 years
- ❑ 3-4 years
- ❑ 2 years or less

30. In the next 5 years, do you expect the percentage of your apple crop that you sell to the following to….			
	Increase	Stay about the same	Decrease
Fresh market wholesale	❑	❑	❑
Retail on farm, farmers market, or other direct marketing outlet	❑	❑	❑
Processors	❑	❑	❑

31. 15 years ago, the percentage of your apple crop that you sold to the following was:			
	Higher than today	About the same	Lower than today
Fresh market wholesale	❑	❑	❑
Retail on farm, farmers market, or other direct marketing outlet	❑	❑	❑
Processors	❑	❑	❑

32. In the past 15 years, have you sold any land parcels for non-agricultural uses?

- ❑ Yes
- ❑ No

33. In the past 15 years, you have....

- ❑ Increased acreage
- ❑ Maintained current level of farm operations
- ❑ Decreased operations

34. In the past 10 years, your farm has been profitable (positive annual cash flow)…

- ❑ 9-10 years
- ❑ 5-8 years
- ❑ 4 years or less

35. Have you made any of the following technological adaptations? Check all that apply.

- ❑ High density plantings
- ❑ High density plantings ï with trellising
- ❑ Integrated pest management
- ❑ Computerized orchard management programs
- ❑ Organic apples
- ❑ Mechanization

36. When was the last time you planted new trees (measured in acres)?

_____ Years ago

37. In the past 15 years, have you…

Added a pick-your-own option for customers	❑ Yes	❑ No
Added farm entertainment options such as tours, hayrides	❑ Yes	❑ No
Increased emphasis on fresh market sales	❑ Yes	❑ No
Increased emphasis on farm stand or farmers market sales	❑ Yes	❑ No
Increased sales of heirloom varieties	❑ Yes	❑ No
Increased your advertising budget	❑ Yes	❑ No
Added value to apples through packaging	❑ Yes	❑ No
Added value to apples through other means	❑ Yes	❑ No

If you have added value to your apples through other means, please explainé

_____
_____
_____

38. Approximately, how many years has the farm been operated by your family?

_____ Years

39. How did you obtain your farm acreage?

- ❑ Inherited or purchased from parents or close relative
- ❑ Purchased from a non-relative
- ❑ Lease from a landlord

40. Which describes your current employment situation?

- ❑ Full-time farmer
- ❑ Employed or self-employed full time, off the farm
- ❑ Employed or self-employed **part** time, off the farm
- ❑ Retired

41. Do you identify yourself as primarily a fruit grower?

- ❑ Yes
- ❑ No

If No, what is your main occupation? _____

42. About what percentage of your taxable household income is from farming?

_____ %

43. Do you consider maintaining your orchard as a hobby or retirement project?

- ❑ Yes
- ❑ No

44. Number of years of your formal education, excluding kindergarten.

_____

45. In what year were you born? 19_____

46. What is the state and county of your primary farming operation?

State _____

County_____

47. If you are a former grower, how many years have you been out of the business?

_____ Years

Any additional comments…

_____
_____
_____
_____
_____

END OF SURVEY – THANK YOU FOR YOUR PARTICIPATION

Please insert the survey in the enclosed envelope and drop it in the mail, no postage required. Once the data is collected, the summary results will be available at:

http://sites.google.com/site/guttmannapplesurvey/

APPENDIX TWO: THE PRE-NOTICE LETTER

THE UNIVERSITY of TENNESSEE KNOXVILLE

COLLEGE of ARTS & SCIENCES

Department of Geography
304 Burchfiel Geography Building
1000 Philip Fulmer Way
Knoxville, TN 37996-0925
Phone: 865-974-2418
Fax: 865-974-6025
utkgeog@utk.edu

December 28, 2009

Grower's name
Address
Address

In a couple of weeks, you will receive in the mail a request to fill out a survey for a research project about the local apple industry.

Have you ever wondered what are the most important reasons why some growers are leaving the industry? Is it due to competition from Washington state? …concentrate from China? …low profit margins? …high land values? …labor issues? …or just growers retiring with no replacements? How are growers changing their business model to meet these challenges and what is their outlook for the future? This study will attempt to answer these questions for the growing region that extends from south central Pennsylvania through the Shenandoah Valley of Virginia.

Whether you produce a couple of acres or hundreds of acres, your opinions are important!

Thank you for your time and consideration.

Sincerely,

Joe Guttmann

Joe Guttmann
University of Tennessee, Knoxville

APPENDIX THREE: COVER LETTER SENT WITH SURVEY

THE UNIVERSITY of TENNESSEE KNOXVILLE

COLLEGE of ARTS & SCIENCES

Department of Geography
304 Burchfiel Geography Building
1000 Phillip Fulmer Way
Knoxville, TN 37996-0925
Phone: 865-974-2418
Fax: 865-974-6025
utkgeog@utk.edu

January 12, 2010

Grower name
Address
Address

I am writing to you to ask your help in a study on the local apple industry. Over the past twenty-five years, the region extending from south central Pennsylvania down through northern Virginia has lost almost half of its acreage devoted to apples. The purpose of this project is to learn from current and former growers like yourself 1) why you think local apple acreage has been declining and 2) what changes you have made to enable your business to remain successful in the face of recent challenges to the industry.

How did I get your address? I obtained your address from either the USDA Farm Service Agency, your state apple association, or from websites available to the general public.

Who am I? I am a graduate student at the University of Tennessee. I grew up in the Eastern Panhandle of West Virginia and I am a graduate of Hedgesville High School (near Martinsburg, WV). Observing the changes taking place in the area is what initially inspired this research project.

How will the data be used? The data from this survey will be used in my dissertation, a requirement for the completion of the Ph.D. degree in geography. I will make the summarized results of this survey available to you on the internet at http://sites.google.com/site/guttmannapplesurvey/. These will also be sent to the state apple associations and other interested agencies. I plan on publishing the results in both agricultural trade magazines that focus on the fruit industry and academic journals. In a couple of years, I may compare the results of this survey with responses from growers in New York, Michigan, and North Carolina.

Will your privacy be protected? YES! Your answers are completely confidential and will be released only as summaries in which no individual's answers can be identified. A number is on the back of each booklet so that when you return your completed questionnaire, your name will be deleted from the mailing list and never connected to your answers in any way. This survey is voluntary. If for some reason you would prefer not to respond, please let me know by returning the blank survey in the enclosed stamped envelope.

If you have any questions about this survey or would like more details on how your privacy will be protected please contact me at (304) 261-6298 or jguttman@utk.edu.

Thank you very much for helping me with this study.

Sincerely,

Joe Guttmann

Joe Guttmann

P.S. Whether you produce a couple of acres or hundreds of acres your opinions are important!

APPENDIX FOUR: REMINDER POSTCARD AND THANK YOU POSTCARD



Several weeks ago, you should have received a survey for current and former apple growers in the Mid-Atlantic region. If you have already completed and returned the survey, thank you for helping me with this study. If not, I hope that you will be able to take the time to do so soon.

Whether you produce a couple of acres or hundreds of acres, your opinions are important!

Thank you,
Joe Guttmann

Periodic updates of the results of this survey can be viewed at:
http://sites.google.com/site/guttmannapplesurvey

REMINDER POSTCARD



(Text of the thank you postcard was handwritten and personalized if possible)

Periodic updates of the results of this survey can be viewed at:
http://sites.google.com/site/guttmannapplesurvey

THANK YOU POSTCARD

APPENDIX FIVE: COVER LETTER SENT WITH THE SECOND MAILING OF THE SURVEY

THE UNIVERSITY of TENNESSEE KNOXVILLE

COLLEGE of ARTS & SCIENCES

Department of Geography
304 Burchfiel Geography Building
1000 Phillip Fulmer Way
Knoxville, TN 37996-0925
Phone: 865-974-2418
Fax: 865-974-6025
utkgeog@utk.edu

February 25, 2010

Grower Name
Address
Address

In mid-January, you should have received a copy of the enclosed survey for current and former apple growers in our region. This survey is part of a study on the changes that are occurring in the local apple industry. So far, over half of the growers who received a survey have responded. I would like to be able to include your opinion too. Whether you produce a few acres, hundreds of acres, just lease your land, or have been out of the business for a few years, your opinions are important and will help increase the accuracy of the results.

As mentioned in a previous letter, this study is in fulfillment of my Ph.D. degree at the University of Tennessee. More detailed information about this study can be found at **http://sites.google.com/site/guttmannapplesurvey/**
Some preliminary results have already been posted. More extensive results will be posted following the conclusion of the survey at the end of March.

I hope you will fill out and return the survey soon, but if for any reason you prefer not to answer it, please let me know by returning the blank booklet in the enclosed stamped envelope.

If you have any questions, please feel free to contact me at (304) 261-6298 or jguttman@utk.edu

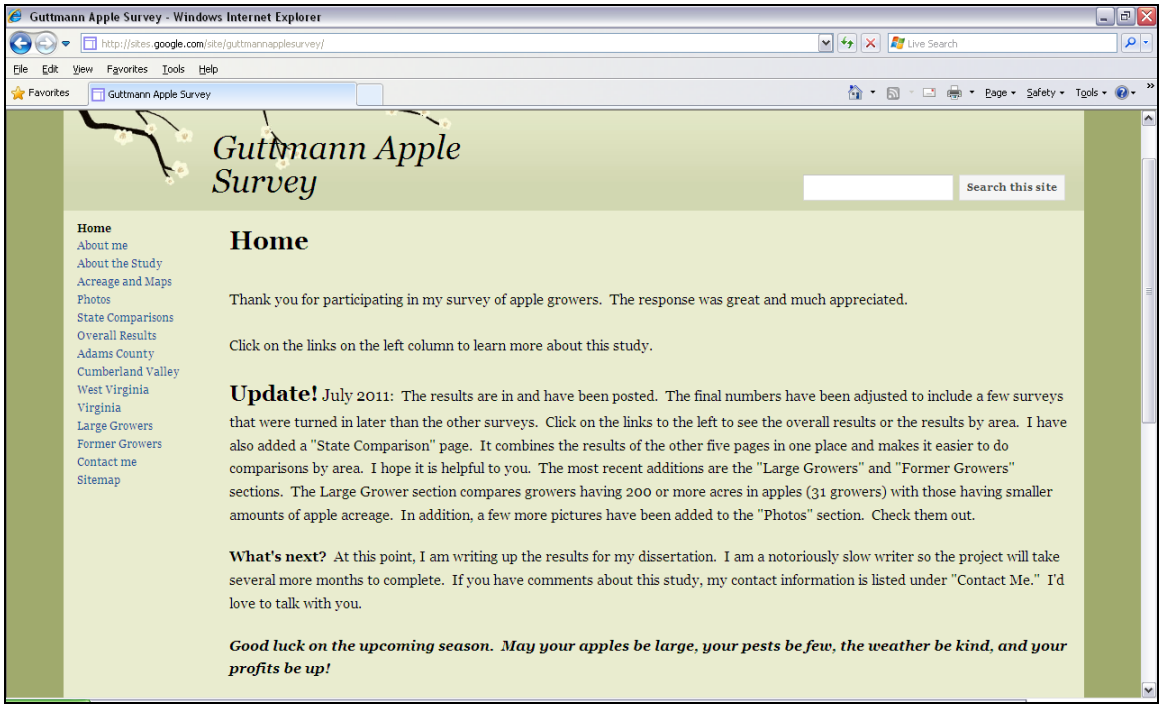
Thank you for your time and effort.

Sincerely,

Joe Guttmann

APPENDIX SIX: THE WEBSITE

Website url = http://sites.google.com/site/guttmannapplesurvey/



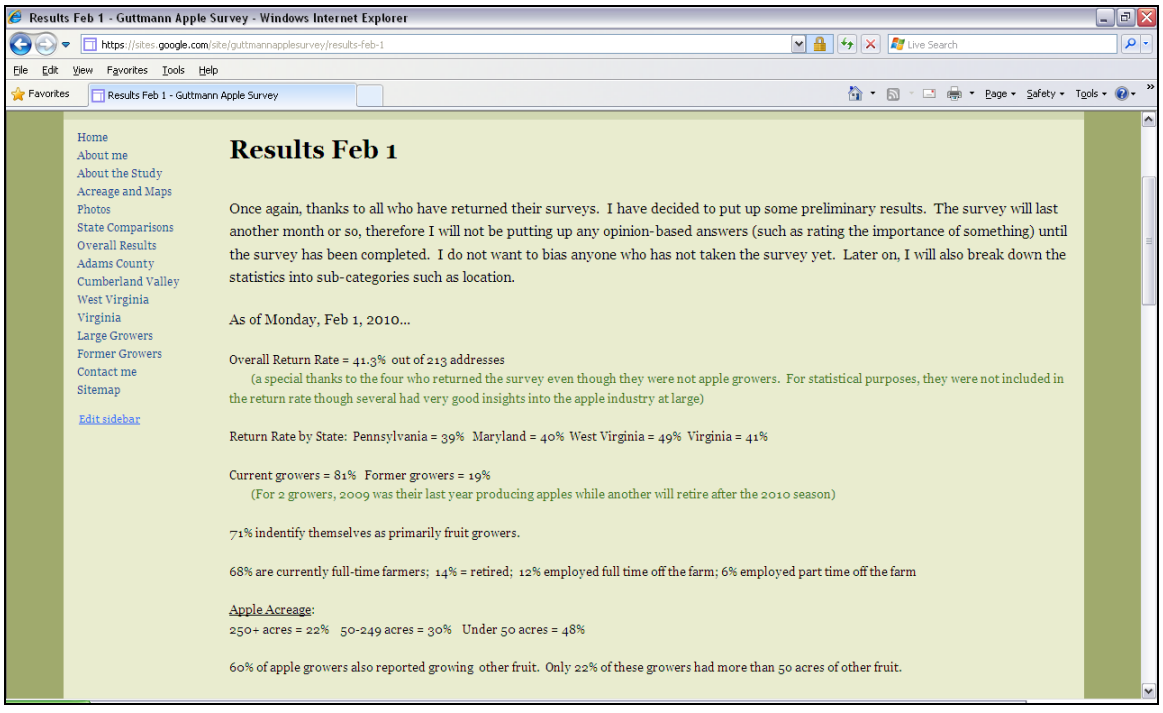
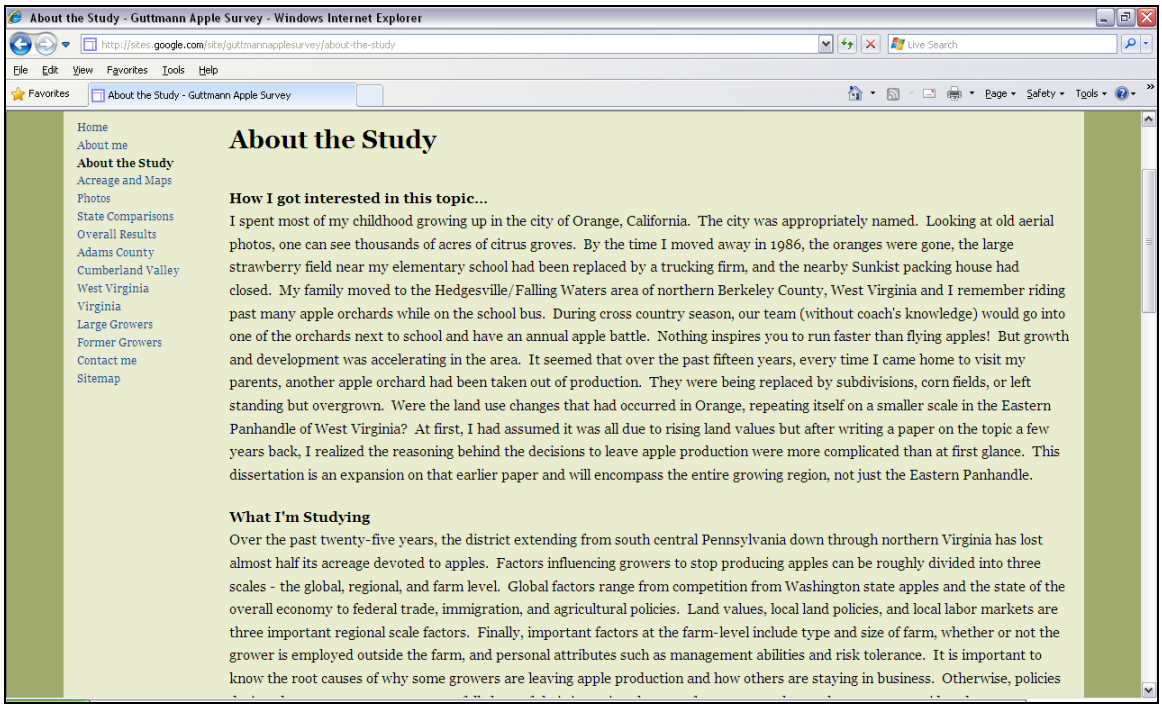


Figure A.1 Screenshots from "Guttmann Apple Survey" Website
Top ï Home page, menu of the website is located at left-hand column *Bottom* ï Posting of the preliminary results of the survey



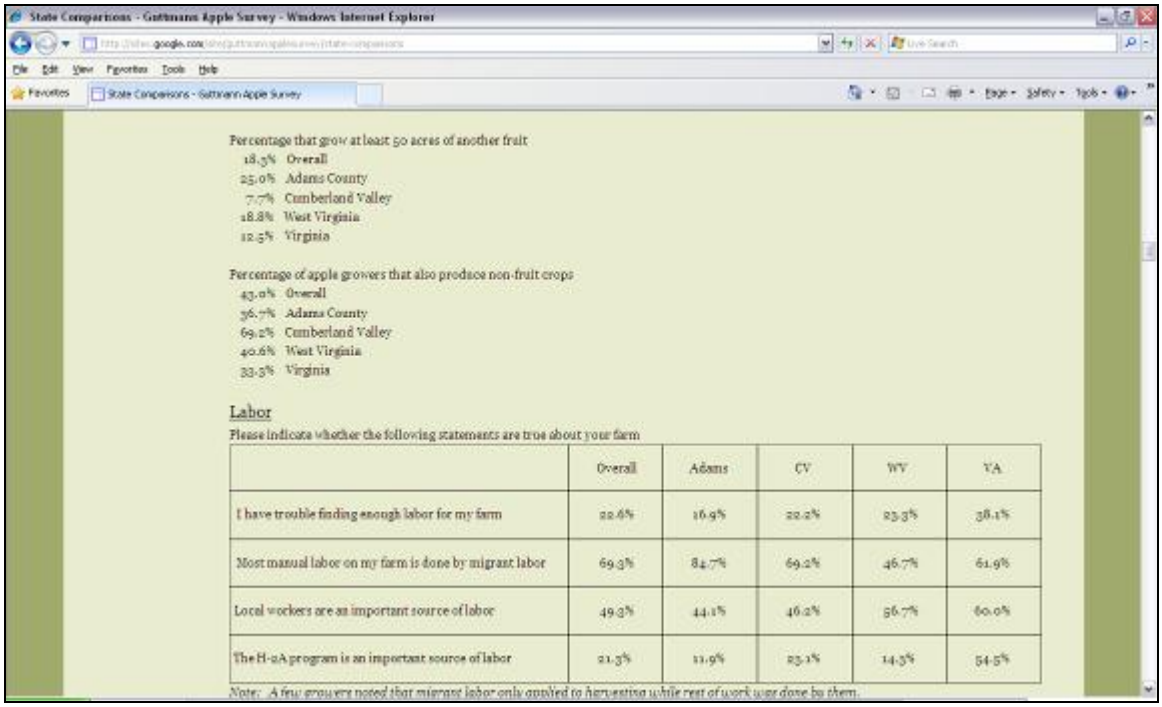


Figure A.1 (continued)
Top ï ñAbout this Studyò includes sections describing how I got interested in the topic, the focus of the study, and how the study relates to the discipline of geography *Bottom* ï Posted final results

APPENDIX SEVEN: INTERVIEW CONSENT FORM

The University of Tennessee
Office of Research
Research Compliance Services

INFORMED CONSENT FORM:

Agricultural Land Use Change in the Urban-Rural Fringe: A Case Study of an Apple-Growing District in the Eastern United States
Joe Guttmann, Principal Investigator

You are invited to participate in a research study. For the purpose of this project, the Principal Investigator plans to interview apple growers and non-growers with knowledge of the industry. Specifically, the Principal Investigator wants to learn why apple acreage in the Shenandoah-Cumberland fruit district has been declining for the past twenty-five years, why some areas of this district have declined at a faster rate than others, and what management practices remaining growers have adopted to keep their operations viable. This project will serve as the Principal Investigatorôs dissertation, a requirement for completion of the Ph.D. degree in Geography.

INFORMATION

If you decide to participate in this study, the Principal Investigator will interview you about the state of the local apple industry and your future plans. During the interview, the Principal Investigator will take notes or, if you agree, the Principal Investigator will tape record the interview. You will have the right to retract your statements and to watch the Principal Investigator erase whatever you do not wish to be included on the tape. Audio recordings are for analysis purposes only. The tapes and transcripts will be securely stored at the Principal Investigatorôs residence. Upon completion of the project, the tapes will be destroyed. Consent forms will be stored at the University of Tennessee for a period of three years.

Risks: To minimize the risk to you, you have the right to watch the Principal Investigator erase anything that you do not wish to be included in the cassette recordings. Also, the Principal Investigator will create a pseudonym (another name) or just use a generalizing statement (ex. one Adams County grower saidé) to refer to you in the written portion of this project if you wish. In a couple of years, the Principal Investigator may use your statements with those of growers from New York, Michigan, and North Carolina.

Benefits: This research will contribute to the literature on farm exits and agriculture within the urban-rural fringe. The Principal Investigator plans to use this data in his dissertation and will make the data available to the appropriate state apple associations. The Principal Investigator may publish the results of the project in academic journals and agricultural trade magazines that cater to the fruit industry. The Principal Investigator

would be happy to provide you with an electronic copy of the final written portion of this project if you provide the Principal Investigator with your contact information.

Confidentiality: Although the Principal Investigator does not anticipate asking you anything objectionable, the Principal Investigator will create a pseudonym (another name) that the Principal Investigator will use when referring to you or quoting your statements in the written portion of this project if you wish. If you desire, the Principal Investigator will leave out any information (your job title for example) that could be used to identify you or your comments. If the Principal Investigator wishes to use this information for any purpose other than their dissertation, an article published from the dissertation, or a comparison study with other growers in the Eastern United States, the Principal Investigator will secure addition permission from you.

CONTACT

If you have questions at any time about the study or the procedures, you may contact Joe Guttmann (304-261-6298, jguttman@utk.edu). If you have questions about your rights as a participant, contact the Research Compliance Services section of the Office of Research at (865) 974-3466.

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty.

CONSENT

I have read the above information and agree to participate in this study. I have received a copy of this form.

Participant's name (print) _____

Participant's signature _____ Date _____

I agree to allow the Principal Investigator to use my real name to refer to my statements in the written portion of this project.

Participant's Signature _____ Date _____

I want the Principal Investigator to use a pseudonym to refer to my statements in the written portion of this project.

Participant's Signature _____ Date _____

APPENDIX EIGHT: A CLOSER LOOK AT KNOUSE FOODS

The Knouse Foods grower cooperative is the largest apple processor in the Shenandoah-Cumberland Valley Fruit District and one of the major players in the national market. As a cooperative, its members may earn a higher price for their fruit than they would on an open market. Members also receive an annual patronage payment that returns the companyôs profits to the members, minus what the company needs to maintain for working capital. This patronage payment is akin to a shareholder dividend (Jacobs 1990; Schotzko 2004; Guise 2010). To counter the patronage payment distributed to the Knouse cooperative members at the end of the season, its Fruit District competitor, National Fruit Product Company, pays its long-time apple suppliers end-of-season ñbonusò payments (Evans 1957; Reany 2002).

In a typical year, Knouse processes between 400ï 500 million pounds of apples, 3ï 4 million pounds of peaches, and 15 million pounds of tart cherries (Guise 2010). In addition to the cooperative members and other local growers, Knouse Foods also sources apples from North Carolina, New York, and Washington (Rowles 2001a; Owings 2007). For example, Knouseôs line of organic applesauce is made from Washington apples because of the difficulty of growing organic apples in the eastern United States (Guise 2010). Knouse Foods CEO Ken Guise notes that Knouse buys so much outside fruit because the company has developed its sales program beyond what its grower members can produce. This is an enviable position because the downfall of some agricultural cooperatives in the past was from having a glut of product without the corresponding sales program (Guise 2010).

Foodservice, retail brands, and private labels each account for roughly one-third of Knouse Foodôs sales. This diversification of market outlets has proven beneficial when one business sector suffers a slowdown. For example, the recession-driven slump in restaurant sales has caused a decline in Knouseôs foodservice sales but has not impacted the other two-thirds of Knouseôs business. Despite the temporary downturn, Knouse has a strong position in the foodservice sector with 60ï 70 percent of the national market share for processed apple products (Guise 2010). Among foodservice outlets, institutions such as schools and health care facilities use large volumes of processed apple products. Schools are mandated to provide nutritional meals at an affordable cost. Apple juice and applesauce are frequently served in school cafeterias because the products count as a serving of fruit and the preparation is not labor-intensive (Rowles *et al*. 2001). Knouseôs foodservice department also handles its bulk ingredient sales to other food manufacturers.

Since its purchase of Adams Countyôs (PA) Musselman Company in 1985, Knouse Foods has maintained both its original label, ñLucky Leaf,ò and the ñMusselmanò brand (Horst 1999). A full line of products including apple juice, pie fillings, and various flavors of applesauce are produced for both labels. The only difference is that vinegar products are offered only under the Musselman label. Because many retailers have limited the number of brands being sold on their shelves, it is unlikely today that both Musselman and Lucky Leaf applesauce would be sold at the same store. In markets where both labels are sold, Knouse will usually distribute its strongest brands at the major retailers and reverse the brands for the lower-end market channels. For example,

Musselman will be used for applesauce and Lucky Leaf for pie fillings at a Safeway grocery store while Musselman pie filling and Lucky Leaf applesauce will be sold through the dollar stores. This strategy prevents consumer price confusion which could occur if Musselman applesauce was being sold for $1.40 in the supermarket but only for $1.00 at the dollar store in the same market area (Guise 2010).

Unlike fresh produce trade practices, manufacturers like Knouse pay retailers slotting fees to acquire and maintain shelf space for their processed products (Calvin *et al*. 2001). Another difference between retailing produce and processed products is the available retail outlets. In addition to traditional grocery stores and mass market supercenters, Knouse products are sold in large quantities at convenience stores, dollar stores, drug stores, and mass market general merchandise stores without supercenters (Martinez 2007; Guise 2010; Kaufman and Kumcu 2010). Ken Guise, the president of Knouse Foods commented ñYou would be amazed at how much (product) someone like a Walgreens or other drugstores can move by putting out a little wing display in each of their stores.ò

Knouseôs advertising for its retail brands consists of a mix of print, television, and internet media. Knouseôs overall consumer advertising budget is limited and Guise concedes that the budget needs to be increased in order to grow the brands. The company will run television ads in four or five markets per year and sponsors a televised ice skating program. Because retail sales account for only one-third of Knouseôs sales, its advertising strategy is different than a company like Mottôs that lives and dies with its retail brand. Guise estimates Mottôs branded retail share is three times that of Knouseôs

branded retail share but Knouse processes more than twice as many apples as Mottôs because Knouseôs private-label and foodservice sectors are much larger than Mottôs (Guise 2010). Several respondents to a survey of northeastern U.S. apple processors commented that Mottôs was the only company making an adequate investment in its products through promotion, advertising, and innovation (Rowles 2001a).

The final one-third segment of Knouseôs business is private-label sales (Guise 2010). Private-label goods are products sold under the retailerôs trade name and not the Musselman or Lucky Leaf brand (Calvin *et al*. 2001). Producing a retailerôs private-label brand gives processors like Knouse steady business from large customers without the expense of promoting its own brand (Tropp *et al*. 2008). Whereas innovation in new product development and new packaging is usually geared towards a processorôs own brands, private labels have tended to be derivatives of name brand products and are positioned to sell at a discount (Jacobs 1990; Martinez 2007; Tropp *et al*. 2008; Guise 2010). Knouse packs for almost every major supermarket chain in the United States. Some of the supermarket chains have exclusive agreements with Knouse while other chains use several private-label suppliers. Knouse produces and packs private-label products according to specifications set by the customer. For example, for those customers concerned more about price than quality, Knouse will be less particular about the blends of apples it uses. On the other hand, if a supermarket wants to market its private-label as ñpremium,ò Knouse may use the Musselman blend of applesauce but charge the customer a higher price than the customer requiring a low-cost blend. In the end, despite additional costs such as advertising, product development, the need to

support a sales force, and paying slotting fees for retailer shelf space, Knouseôs retail brands earn slightly higher profits per unit than Knouseôs production for private labels (Guise 2010).

The mass importation of cheap, foreign apple juice concentrate has forced Knouse Foods to modify its business strategy. While Knouseôs juice bottling line speeds are designed to clean, press, filter, bottle, and pasteurize juice from fresh apples, other companies can just mix concentrate with water and bottle the apple juice at superior speeds. This has put Knouseôs production capabilities at a competitive per unit cost disadvantage. In the 1980s, more than 50 percent of the apples received by Knouse and 40 percent of Knouseôs total sales were derived from apple juice (Guise 2010). Because growing juice apples are no longer profitable for its grower members, Knouse has de-emphasized its apple juice production so that less than 5 percent of the apples the cooperative receives are juice apples. Apple juice now accounts for only 8 percent of Knouseôs total sales. Knouse currently produces a 100 percent fresh-pressed ñpremiumò apple juice and a ñregularò apple juice consisting of a fresh-pressed/concentrate blend. The concentrate used by Knouse is imported from countries such as China, Argentina, and South Africa. The concentrate/fresh-pressed ratio used in the regular apple juice may differ depending on the apples the company receives in a year. Knouseôs goal concerning its apple juice is to maintain shelf space, generate enough overhead to keep the juice lines operating, and provide an outlet for the both the juice apples it receives and juice pressed from the peels and cores of the peeler apples used for sauce and slices (Guise 2010).

VITA

Joseph Paul Guttmann was born in the northwest suburbs of Chicago but spent most of his childhood in Orange, California. When Joe was 13, he moved to the Hedgesville/Falling Waters area of Berkeley County, West Virginia where his parents, Paul and Elaine Guttmann, still reside. After graduating from Hedgesville High School in 1991, Joe attended Wake Forest University where he received his Bachelors of Arts in History. He has earned Master of Arts degrees in Secondary Education and Geography from Marshall University. Joe has represented Marshall University and the University of Tennessee at the World Geography Bowl, winning one national individual title and two national team titles. During the summers, Joe was employed by the National Park Service as a park ranger. He has worked three seasons at the Jefferson National Expansion Memorial (the Gateway Arch in St. Louis) and four seasons as a cave guide at Mammoth Cave National Park in Kentucky. Joe has taught geography courses at Marshall University, the University of Tennessee, and was a full-time lecturer at Clemson University. He has also served as a reader for the Advanced Placement Human Geography exam. Joe spent two months volunteering at an all-girls high school in rural Ghana, studied a semester in Venice, Italy, and has traveled extensively.