ESTIMATING THE ECONOMIC AND FISCAL IMPACTS OF AN EXTENDED BERRY GROWING SEASON AND EXPANDED BERRY PROCESSING SECTOR ON THREE SELECTED APPALACHIAN OHIO COMMUNITIES

THESIS

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By

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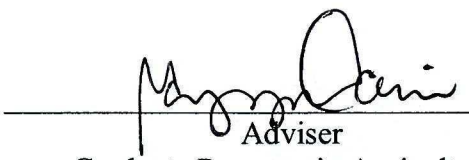

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ABSTRACT

Appalachian counties of Ohio have struggled economically relative to the rest of Ohio due to the nature of their agricultural production and lack of employment opportunities. Recent research has found that berries are a viable cash crop alternative to tobacco, the former mainstay of the region. The objective of this study was to estimate the economic and fiscal impacts of an extended berry growing season and expanded berry processing industry. IMPLAN software and personal interviews with local decision-makers were used to obtain data and estimate impacts. Increases in both the berry production and processing sectors resulted in less than a one percent increase for all study regions. However, considering the relative sizes of the regional economies, this was more significant than a county-level increase in both production and processing.

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CHAPTER 1

INTRODUCTION

1.1 Background

U.S. agriculture has been continuously shifting, both in farm size and in the vitality of small, rural farm operations. Health-related issues have caused production to shift toward broader geographic distribution of fresh fruits and vegetables, leaner meats, and a significant reduction in the production on tobacco farms in southern Ohio. Small acreage farms that typically depended upon tobacco have begun to look for alternative sources of income (Batte, 1).

Southern Ohio is characterized by small farms, often with limited resources. Because of the topography, many of these farms have typically depended upon tobacco for farm income. Land in the region is not well-suited for intense cultivation of high volume crops, thus making tobacco an extremely viable crop. Tobacco was once a major cash crop in the state of Ohio, mainly in the southern region of the state (Batte, 4).

The U.S. Department of Agriculture 1997 survey ranked Ohio as number five in total tobacco farms and number seven in total tobacco acreage. According to the Ohio Department of Agriculture, in 1997 there were 2,821 tobacco farms harvesting 11,284 acres. By 2002, there were 1,845 tobacco farms harvesting 5,764 acres, a 35 – 40% decrease. Overall quantity declined from 21.1 million pounds of tobacco in 1997 to 10.1 million pounds in 2002, a 53% decrease

(USDA/NASS, 2002). This significant decrease in both the number of tobacco farms and harvested acres in the state may be the result, in part, of the 1998 Tobacco Master Settlement Act.

The Tobacco Master Settlement Agreement (MSA) of 1998 was meant to provide state governments with compensation for smoking related medical costs and to help reduce smoking in the United States. There was no limit to the yearly settlement payments; they were perpetual (*Tobacco Master Settlement Act*, 2006). The MSA essentially resulted in tobacco companies agreeing to limit their advertising and help 46 states recoup health-care costs associated with tobacco use. Ohio received $10.1 billion to be distributed over a 26-year period (Leingang, 2004). As a result, many farmers were bought out or began seeking other sources of farm income, thus necessitating a new, high-value crop for these southern Ohio farmers.

Health-related developments over the years have also heavily contributed to the reduction in tobacco use and production. According to the United States Surgeon General, there have been more than 12 million premature deaths attributable to smoking since the first published Surgeon General's report on smoking and health in 1964, and smoking remains the leading preventable cause of premature death in the United States (US Surgeon General, 30). The Surgeon General's report stated that smoking is the cause of the following diseases: lung cancer, laryngeal cancer, oral cavity and pharyngeal cancers, esophageal cancer, pancreatic cancer, bladder and kidney cancers, cervical cancer, ovarian cancer, stomach cancer, acute leukemia, subclinical atherosclerosis, coronary heart disease, strokes, abdominal aortic aneurysms, acute respiratory illnesses, chronic respiratory illnesses, shortened pregnancies, cataracts, and periodontitis (US

Surgeon General, Ch. 1). The US Surgeon General has generated numerous updates to the original 1964 report, and efforts have been launched nationwide to reduce smoking and tobacco dependence.

In addition to the decrease in tobacco use, farms in general have begun to produce a greater variety of fresh fruits and vegetables, leaner meats and poultry, resulting in a significant reduction in tobacco production not only in Ohio, but in other historically high production areas. Fruit is considered a high-value product, and berry consumption is increasing (Bertelsen, 18). Sergio Lence of Iowa State cited three major factors that have contributed to increased per capita berry consumption: (1) New information on the health benefits of berry consumption; (2) The increasing supply of strawberries in the U.S.; and (3) The year-round availability of strawberries to consumers (Lence, 9). Advertising is also a factor contributing to increased demand. Furthermore, increased consumption has been made possible via the expansion of domestic supplies and availability as the industry transitioned from seasonal to year-round production (Cook, 2). In addition to fresh berries, demand for processed berries has also increased, which can be seen in the expanding market for processed jams, jellies, and preserves.

The strawberry is one of the 4 most popular small fruits in the U.S. with annual per capita consumption of over 5 pounds. Berry consumption continues to rise as berries have gained much publicity on their numerous health benefits. A highly advertised fruit, berries are known for their high concentration of antioxidants and vitamins. Berries contain phytochemicals, which are

components of fruits or vegetables that help prevent certain diseases, and perhaps, even help to treat certain disorders (*Nutritional Benefits of Eating Berries*). Specifically, berries contain anti-cancer properties. Vitamin C, calcium, magnesium, folic acid, and potassium are other known elements (*Nutritional Benefits of Eating Berries*). Ultimately, it has been this combination of factors – decreased tobacco use and production, increased awareness of the health benefits of berries, and an increased value of berries as a crop – which has lead to the notion that berries could serve as a viable alternative to tobacco for farm income.

Ohio is listed as one of the top U.S. berry producing states. Southern Ohio could be a viable area for extended season berry production as a stimulus for local economies. Through careful selection of berry types, varieties, and production systems, it is possible to grow fresh berries in Southern Ohio and other U.S. regions of similar climate and topography from April through early November without investing in greenhouse facilities (Batte, 1). Strawberries are grown from June to July. Blueberries are grown from June to September, depending on the variety. Blackberries are grown from July to August. Additionally, two distinct varieties of red raspberries are grown from June until frost (Batte, 4). All of these berries are suitable for extended growing seasons. The availability of more berries could very likely also expand the processing sector.

This thesis is part of a three-phase project which aims to determine the impacts from the adoption of a full-season system of berry production with sales to high value markets on small

farms and rural communities. Small-acreage farms that traditionally depended upon a tobacco base to generate income have begun looking for alternatives that may approach the per-acre returns of tobacco. Small fruit production has similar production requirements to those of tobacco. Tobacco production is labor and management intensive and small acreage oriented. Small fruit production can provide a significant income that more closely approaches tobacco than many other alternatives (Batte, 6). Berries are an appropriate alternative to tobacco production, as it is possible to grow berries in the southern region of Ohio as well as in the southern United States from the months of April to November without investing in greenhouse facilities (Batte, 1).

Phase one of the three-phase project examined the impacts on farm profitability and long term prosperity of new agricultural products and/or production methods suitable for small and moderate-sized farms in the Appalachian region of Ohio and elsewhere. Phase one developed investment analysis tools useful to assist farm managers in judging the financial impacts of adoption of these farming systems (Batte, 7). Phase Two focused on marketing factors associated with increased local berry production levels. Consumer intercept surveys were used to determine "willingness-to-pay" for locally produced berries and berry products. Phase three estimated the potential economic and fiscal impacts of increased local berry production in selected Ohio counties. Based on the potential success in these selected counties, specific characteristics critical to success were identified to determine other areas in which the extended berry production season techniques would be viable.

This thesis focused on phase three of the project and seeks to estimate the economic and fiscal impacts of an extended berry production season and expanded processing industry on selected Ohio counties. This phase was primarily data-driven, with data being obtained from personal interviews with local government officials and IMPLAN software databases. Data were used to construct economic models using IMPLAN software. The constructed models estimated the fiscal and economic impacts of the extended berry production season and expanded berry processing industry.

1.2 Problem Statement

Appalachian counties of Ohio have struggled economically relative to the rest of Ohio due to the nature of their agricultural production and lack of employment opportunities (Isserman, 1996). Historically, counties located in this region of Ohio depended heavily upon tobacco for farm income (Batte, 4). Appalachian Ohio is characterized by numerous small farms, and farmers that previously depended upon tobacco for income now seek an alternative crop. Recent public health policy has focused efforts on reducing tobacco production and advertising across the U.S. The reduction of tobacco production has exacerbated economic challenges, specifically as they relate to farm income, in Appalachian Ohio.

Recent research has found that berries are a viable alternative to tobacco, especially due to their health benefits. Innovative new production methods can make berry farming more profitable because of the ability to extend the berry growing season and expand the berry

processing industry. Understanding the potential benefits of this endeavor in the communities in which such benefits occur can help inform local officials and the agricultural community of the viability of this practice.

The problem is that Appalachian Ohio communities have limited resources that can be devoted to economic development strategies. An extended season for berry production and an expanded processing sector is one such idea to spur the Appalachian Ohio economy into growth, but the potential economic and fiscal impacts of an extended season berry farming practice at the county level must be explored to determine whether or not such a strategy would be suitable.

1.3 Research Hypothesis

The research hypothesis for this study centered on the economic and fiscal impacts of an extended berry production season and expanded processing industry in three Appalachian Ohio communities. The main question addressed in this study was "How would an extended berry production season and expanded berry processing industry impact these three typical Appalachian Ohio communities?"

1.4 Purpose and Objectives

The purpose of this study was to estimate the economic and fiscal impacts of an extended berry production season and an expanded berry processing industry in three selected Appalachian Ohio communities. The following objectives were addressed:

1. Determine the net income associated with existing levels of berry production.

2. Determine the net income associated with existing levels of berry processing.

3. Estimate the economic impact of increased berry production in three regional case study economies.

4. Estimate the economic impact of increased berry processing in three regional case study economies.

5. Estimate the fiscal impact of increased berry production in three regional case study economies.

6. Estimate the fiscal impact of increased berry processing in three regional case study economies.

1.5 Definition of Terms

The following terms have been defined for the purpose of this study:

1. **Multiplier**: summarizes the total impact that can be expected from change in a given economic activity
2. **Input**: factor used in the production of outputs
3. **Output**: final goods and services
4. **Income**: the monetary return from resources owned by a household at a given time period

5. **Value added**: the additional value added to the product as a result of an economic activity
6. **Employment**: both full-time and part-time jobs
7. **IMPLAN**: (IMpact analysis for PLANning) created by the Minnesota IMPLAN Group, Inc.; software used to estimate the effect on a regional or local economy given a change in that economy. IMPLAN builds economic models estimating future impacts of similar changes on communities.
8. **Institutions:** the type of final demand sector; they are personal consumption expenditures or purchases made by households, federal, state, and local purchases, investment purchases, and trade
9. **Industries**: the collection of businesses in an economy within a given region, purchasing goods and services and paying workers
10. **Study regions**: For this paper, the study regions included Highland, Morgan, and Ross counties in Ohio
11. **Direct effects**: the changes in the industries to which a final demand change was made
12. **Indirect effects**: the changes in inter-industry purchases as they respond to the new demands of the directly affected industries
13. **Induced effects**: the effects that reflect changes in spending from households as income increases or decreases due to the changes in production
14. **Consumption**: the final use of goods and services to provide utility

15. **Utility**: a measure of the relative satisfaction or desiredness from the consumption of goods
16. **Economic model**: a theoretical construct that represents economic processes by a set of variables and a set of logical and quantitative relationships between them
17. **Descriptive model:** describes the transfers of money between industries and institutions; it contains the social accounts and the input-output accounts
18. **Predictive model:** the set of input-output multipliers which "predict" total regional activity based on a change in consumption – i.e., a vector of expenditures
19. **Input-output multipliers:** the notion of a multiplier rests upon the difference of the initial effect of a change in final demand and the total effects of that change
20. **Social accounting matrix (SAM):** a set of regional economic accounts which describe transfers between institutions, as well as, value added components
21. **New Economic Geographic Theory:** measures the effects of labor and industry agglomeration; allows for the estimation of commuting, transportation and accessibility costs, using the concept of "effective distance"
22. **Effective distance:** the mechanism through which the theory of economic geography enters the decision-making process of economic agents in REMI; it adjusts the geographic distance between two centers of economic activity, based on the efficiency of multi-modal transportation between them
23. **Agglomeration effect:** effects resulting from the agglomeration of populations and the resulting infrastructure facilities, labor pool, and quality of life; effects resulting from the

clustering of industrial activities giving rise to an industrial climate with positive and negative effects

24. **Profit:** the return on a business undertaking after all operating expenses have been met
25. **Type I multiplier:** measures the direct and indirect effects of a change in economic activity; it captures the inter-industry effects only, i.e. industries buying from local industries
26. **Type II multiplier:** captures the direct and indirect effects; in addition to inter-industry effects, it takes into account the income and expenditures of households
27. **Type SAM multiplier:** uses all information about the institutions selected to be included in the predictive model
28. **Value-added:** payments made by industry to workers, interest, profits, and indirect business taxes
29. **Economic Impact Analysis:** an estimate of how a proposed investment or disinvestment will affect a local economy; makes use of economic multipliers and current economic conditions to estimate economic impact
30. **Fiscal Impact Analysis**: an estimate of how a proposed investment or disinvestment will affect the financial structure of a local economy; makes use of local tax structure, local infrastructure, and local expenditures

1.6 Limitations of This Study

Economic impact analyses attempt to estimate how a change in final demand of one sector of the economy will affect the economy as a whole. Economic impact analysis is an *estimate* and not a guaranteed set of figures. While it provides an estimate of the effects of a new development or project, it cannot give exact details of what will happen as a result of this investment or disinvestment.

Fiscal impact analyses can be tailored to any community and can include a number of components, both an attribute and a limitation. There is no single formula or combination of components to comprise a fiscal impact analysis, and the analysis depends on the characteristics of the community in question, which will differ from community to community. Furthermore, a fiscal impact analysis requires extensive data to yield refined estimates (Harrison and French, 2004). Most simple forms of fiscal impact analysis fail to incorporate variation in the costs of providing services over space. Despite these limitations, fiscal impact analyses are usually able to provide a much more refined estimate because of their use of stratified analyses.

This study examined three Appalachian Ohio communities – Highland Region, Morgan Region, and Ross Region – and its findings are generalizable to these communities only. Data used were current for the year 2006. Furthermore, the study used arbitrary berry production increases of 10% and 20%. Berry production increases would not necessarily occur in such increments and therefore must only be taken for the estimates that they are. Arbitrary figures were used to estimate the impact of a small berry processing facility entering the study regions.

A new or expanding berry processor may employ more or less than the FTE's used in this study. Processing facilities were not present in the Highland Region, so averages were taken from the Morgan and Ross Regions estimate processing impacts in the Highland Region. As with the situation of the hypothetical processor, berry processing in the Highland Region will not necessarily look like what this study suggested.

1.7 Need for This Study

Appalachian Ohio is an economic region in the United States that is in need of an economic stimulus to improve residents' standard of living (Isserman, 1996). This study's findings could inform local officials – economic development directors and Ohio State University Extension Educators, for example – of how an extended berry production season and expanded berry processing industry could potentially increase employment, employee compensation, proprietor income, and/or output in the study communities. Truly understanding how a project will affect the local community can better enable policymakers to allocate limited resources needed for economic development. Understanding development options can educate government officials as to whether or not the extended berry production season and an expanded berry processing industry might increase employment, employee compensation, proprietor income, and/or output. Furthermore, the information presented in this study could help government officials identify characteristics that make an extended berry production season and expanded berry processing industry successful in a community, such as a processing infrastructure already present for the increased production of berries.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Purpose and Objectives

The purpose of this study was to estimate the economic and fiscal impacts of an extended berry production season and an expanded berry processing industry in three selected Appalachian Ohio communities. The following objectives were addressed:

1. Determine the net income associated with existing levels of berry production.
2. Determine the net income associated with existing levels of berry processing.
3. Estimate the economic impact of increased berry production in three regional case study economies.
4. Estimate the economic impact of increased berry processing in three regional case study economies.
5. Estimate the fiscal impact of increased berry production in three regional case study economies.
6. Estimate the fiscal impact of increased berry processing in three regional case study economies.

2.2 Economic Impact Defined

For the purposes of this study, economic impact is defined as the effect on employment levels, employee compensation, proprietor income, and output produced by a decision, event, or policy.

2.3 Economic Impact Analysis Defined

Though numerous economic impact analysis models exist, there is no single definition for what constitutes an economic impact analysis. Economic impact analyses can be amended to include any combination of economic effects to be studied. According to the Economic Development Research and Training Center (EDRTC) of Penn State University, Harrisburg, economic impact analysis is defined as an analysis that traces spending through an economy and measures the cumulative effects of that spending. Furthermore, economic impact analyses show changes in employment, personal income, business production, sales, profits, and tax collections (*Economic Impact Analysis)*. For the purposes of this study, economic impact is defined as the impact of a change on the local economy, which includes changes in number of jobs, wages, and local income.

2.4 Estimating Economic Impact

Economic impact can be estimated in numerous ways. Economic impact analyses are tailored to the entity requesting the analyses and can include a number of factors. Factors may include the effect of a change on: employment (and conversely, unemployment), wages, business production, sales, profits, and tax collections. Some analyses may also include government revenues and expenditures, though these are commonly studied separately in fiscal impact analyses.

Economic impacts can be estimated using an input-output economic model. Such models can grow to be quite complex depending on the number of factors included, so computer software programs have been designed to make the process easier. The three most-commonly used software programs to estimate economic impact include: IMpact analysis for PLANning (IMPLAN), Regional Economic Models Inc. (REMI), and The Bureau of Economic Analysis' Regional Input-Output Modeling System (RIMS). All three software programs utilize input-output methodology and national input-output matrices to perform their calculations. Additionally, all three programs utilize economic multipliers. An economic multiplier is a number used to estimate economy-wide impacts of industry-specific economic changes. Multipliers are generated from numerical or statistical models of a national or regional economy. Using models, multipliers can be calculated for every business or industry sector in the economy. A multiplier is always greater than one because it is a ratio that is calculated by dividing a) the estimated total effect resulting from a given economic "shock" to the economy by b) a necessarily

smaller partial effect, namely the direct project- or activity-specific effect. Each multiplier can be thought of as an empirical, quantified measurement of the strength of the economic linkages between a given industry or economic sector and the rest of the regional economy. The greater the extent of the linkages, the greater the size of the multiplier. The greater the multiplier, the greater the economy-wide dollar or employment impact of any given stimulus to one industry or sector of the economy (Kay).

2.5 Estimating Economic Impact with IMPLAN

IMPLAN is an input-output software package developed by the Minnesota IMPLAN Group (MIG) in 1979. The software uses its databases to construct descriptive and predictive input-output models. IMPLAN databases are constructed using several public information sources including the US Bureau of Economic Analysis, the US Bureau of Labor, the US Department of Agriculture Crop and Livestock Statistics, the US Geological Survey, and the US Census Bureau (*The IMPLAN Input-Output System*, 1). IMPLAN data files have been published annually since 1990. Complete coverage of the United States is available, for individual states, counties, and ZIP code areas (IMPLAN Local Area Data Files). IMPLAN data files include information for a set of disaggregated industries. Information includes employment, income, value added, household, and government consumption. Along with the data files are national input-output structural matrices. Any data element may be changed within the software program however changing information cannot be reversed.

Once the software program is opened, IMPLAN allows the user to select the state, county, or counties to be included in the study area. Two models are constructed for each region – descriptive and predictive. Descriptive models describe transfers of money between all institutions and industries. Predictive models include the set of input-output multipliers that predict total regional activity based on a change in consumption. Once the model is constructed, it can be viewed in the "Report" section of the program.

IMPLAN estimates economic impact using multipliers. Output multipliers are a common tool in estimating potential economic impact. A multiplier summarizes the total impact that can be expected from change in a given economic activity (Miller, 1). They are essentially simple ratios of total to initial change. There are four multipliers typically used to estimate economic impact (*The IMPLAN Input-Output System*, 13). These include output, employment, income and value added multipliers. Output multipliers estimate the total change in sales. Employment multipliers measure the total change in employment. Income multipliers measure the total increase in income in the study area resulting from a one dollar increase in income received by workers in the exporting industry (Miller, 1). Finally, value added multipliers estimate the additional value added to the product as a result of economic activity. Multipliers are calculated using direct, indirect, and induced effects. Direct effects are production changes associated with the immediate effects or final demand changes. Indirect effects are production changes in backwards linked industries caused by the changing input needs of directly affected industries. Lastly, induced effects are the changes in regional household spending patterns caused by

changes in household income generated from the direct and indirect effects. IMPLAN multipliers include Type I, Type SAM, and Type II (*The IMPLAN Input-Output System,* 13). Type I multipliers are the direct effects, produced by a change in final demand, plus the indirect effect divided by the direct effect. Type SAM are the direct, indirect, and induced effects incorporating information from the social accounts matrix (the social accounts matrix is a component of IMPLAN and show the flow of commodities from industry to producers and institutional consumers. Finally, Type II multipliers are the induced effects caused by household expenditures from new labor income.

Following the construction of a model, results are viewed in the IMPLAN Reports section. Study area reports include output, value-added, and employment; institution commodity demand; household commodity demand; government commodity demand; institution commodity sales; general model information; IMPLAN to Standard Industrial Classification codes; type codes; and an aggregation template. Social accounts reports include an industry balance sheet report; commodity balance sheet report; commodity summary; commodity trade report; institution local commodity demand; household local commodity demand; government local commodity demand; industry summary; industries and commodities in the model; industry import matrix; and an institution import matrix. Social accounting matrix (SAM) reports consist of aggregate SAM; various industry-by-commodity SAM reports; and a 26 file CGE format. Industry-by-industry reports are comprised of institution industry demand; household industry demand; government industry demand; industry output/outlay summaries; aggregate industry-by-

industry SAM; regional industry-by-industry direct coefficients report; regional industry-by-industry transactions report; and various industry-by-industry SAM reports. Additionally, there are multiplier reports and impact reports to further analyze the data.

IMPLAN was used for the economic impact analysis in this study because of its previous use and ease of use.

2.6 Estimating Economic Impact Using Regional Economic Models Inc. (REMI)

Regional Economic Models Inc. (REMI) was founded in 1980 and is comprised of two software programs for economic impact analyses – Policy Insight and TranSight. Policy Insight performs economic forecasting functions and policy analyses. TranSight evaluates the total economic effects of transportation improvements on the local economy. REMI is a dynamic model, which allows for year-by-year analysis on the local economy (Regional Economic Modeling, Inc., *FAQ 1.3*). Dynamic models allow the user to estimate not only what will happen but also when it will happen. The model uses computable general equilibrium (CGE) techniques, time-series panel data, and the New Economic Geographic Theory, which takes into account agglomeration effects due to the benefits of access to broader labor and commodity markets. Data to populate the model comes from several sources: the Bureau of Economic Analysis, the Bureau of Labor Statistics, and the U.S. Census Bureau (Regional Economic Modeling, Inc., *FAQ* 1.4). Two key theoretical economic assumptions are present in REMI software: households maximize utility and producers maximize profits.

For the purposes of this study and if REMI were the chosen economic modeling software, Policy Insight would have been the chosen program. Policy Insight generates realistic year-by-year estimates of the total regional effects of any specific policy initiative. The model is calibrated to many sub-national areas for policy analysis and forecasting, and is available in single- and multi-area configurations. Each calibrated area, or region, has economic and demographic variables, as well as policy variables so that any policy that affects a local economy can be tested (Regional Economic Modeling, Inc., *Policy Insight*). Policy Insight is used widely throughout the United States. There are seven features of REMI that are unavailable in other software packages: (1) it is calibrated to local conditions using a large amount of local data; (2) it uses an exceptionally strong theoretical foundation; (3) it combines several different analytical tools, including input-output, econometric models, and economic-base, to take advantage of each method's strengths; (4) it allows users to manipulate several input variables and gives forecasts for several output variables; (5) users can generate forecasts for any combination of future years; (6) it accounts for business cycles; and (7) it has performed well under a variety of diverse situations (Regional Economic Modeling, Inc., *Overview of REMI Policy Insight*).

2.7 Estimating Economic Impact Using Regional Input-Output Modeling System

The Regional Input-Output Modeling System (RIMS II) was developed in the 1980's as an update to the original RIMS software from the 1970's. RIMS II is based on an input-output table that shows the distribution of inputs and outputs in an economy. This table is derived from two sources: the Bureau of Economic Analysis national input-output table and the Bureau of

Economic Analysis regional economic accounts. Multipliers are present in the model, as in all economic impact analysis models, and they can be estimated for any region (comprised of one or more counties), any industry, or any group of industries. Estimating multipliers using RIMS II is a three-step process. First, the producer portion of the national input-output table is made region-specific by using six-digit NAICS location quotients that estimate the extent to which input requirements are supplied by firms in the region. Second, household rows and columns are made region-specific. Finally, the Leontief inversion approach is used to estimate multipliers (Regional Input-Output Modeling System, 2008). There are five types of multipliers used in the RIMS II model: output, earnings, employment, direct-effect earnings, and direct-effect employment. The user must determine the affected region; affected industries; the number of project phases; initial changes in final demand, earnings, or employment; and separating the initial changes.

2.8 Fiscal Impact Analysis Defined

The Natural Resources Defense Council (NRDC) defined fiscal impact analysis as "efforts to estimate the budgetary affects of various types of land uses on local government jurisdictions or other local service providers" (Natural Resources Defense Council, 2008). NRDC also stated that the fiscal impact is the difference between the revenues and expenditures generated by the proposed land use or development scenario. Additionally, the University of New Hampshire's Cooperative Extension Office defined fiscal impact analysis as "a projection of the direct, current, and public costs and revenues associated with residential or non-residential growth to the local jurisdiction(s) in which the growth is taking place" (Harrison and French, 1).

From this definition, fiscal impact analysis deals only with public government costs and revenues and provides officials with a more detailed forecast of what to expect from a particular development or a departing industry. Perhaps the easiest way to think about fiscal impact analysis is to think about the main question asked before performing such an analysis, which is "what will be the effect of this development or land use on our taxes?"

Fiscal impact analysis does have a few limitations. One limitation is the lack of a set of standards when performing fiscal impact analyses (Natural Resources Defense Council, 2008). Fiscal impact analyses can be tailored to any community and can include a number of components. There is no single formula or combination of components to comprise a fiscal impact analysis, and the analysis depends on the characteristics of the community in question, which will differ from community to community. Furthermore, a fiscal impact analysis requires extensive data in order to get refined estimates (Harrison and French, 1). Most simple forms of fiscal impact analysis fail to incorporate variation in the costs of providing services over space. Despite these limitations, fiscal impact analyses are usually able to provide a much more refined estimate because of its use of stratified analyses.

2.9 Estimating Fiscal Impact

Because of its dependence on community-specific characteristics, fiscal impact analyses can take a number of forms. The NRDC stated that the analyst may begin by obtaining a recent budget of the community whose regulatory approval is being sought. Additional data for the community's population, employment, housing units, and commercial and industrial space may

also be gathered (Natural Resources Defense Council, 2008). The analyst would also need to gather information regarding the timing of the development, market and taxable property values, occupancy and employment characteristics, and other pertinent economic and demographic factors. After all of the necessary information is gathered, the likely consequences of the proposed development on the local budget may be calculated.

There are several methods for conducting fiscal impact analyses (Natural Resources Defense Council, 2008). The first of these methods is the average per capita method. This is the most common but least reliable method, and it divides the total local existing budget by the existing population, then multiplying the result by the expected new population associated with the new development. Costs and revenues are then divided by the equivalent population. This method is often used for expenditures and most types of tax revenues, and it uses the community's current cost and revenue patterns to forecast the impact of the new population. However, this method fails to recognize that both cost and revenue patterns can differ significantly between the existing population and the expected population after the development occurs. Additionally, the average per capita method sometimes fails to separate residential and non-residential sectors. Another similar method is the adjusted per capita method that heavily relies upon the subjective judgment of the analyst. Local income, population density, or market value data may be used to overcome the subjective limitation. Another method examined by the NRDC is the disaggregated per capita method. This method "unbundles" the local budget by separately estimating costs and revenues for each of the community's major land use sectors

(Natural Resources Defense Council, 2008). The amounts relevant to each sector are then divided by the number of service units in each sector. This method can provide reasonable estimates but not exact numbers. Finally, there is the dynamic method, the most sophisticated of the aforementioned methods. The dynamic method applies statistical techniques to time-series data (can sometimes be cross-sectional data). This method estimates how much of "this" can be expected to result from so much of "that" (Natural Resources Defense Council, 2008). It is more data-intensive than the other methods, and it must also use individual revenue and expenditure categories because each can be affected differently by the economic, demographic, and land use characteristics of the new development.

Edwards of the University of Wisconsin wrote a step-by-step method for fiscal impact analysis. According to her guide, there are several data needs to perform an analysis. These include a description of the development, local revenue and expenditure data, local property value data and the current millage rate, number of workers in the community, and number of workers anticipated with the new development (Edwards, 2008). Furthermore, she listed nine steps that the analyst must progress through in order to complete a "successful" fiscal impact analysis:

1. Determine population and employment changes associated with the development
2. Disaggregate budgets into categories of service expenditures
3. Allocate costs to residential and non-residential land use

4. Divide residentially-associated costs by the total population to derive a per capita estimate of service costs and divide non-residential costs by the local employees for the per employee estimate of non-residential service costs

5. Calculate the total costs associated with the new development, including residentially-induced costs, non-residential costs, and annual debt service costs

6. Disaggregate budgets into categories of revenue

7. Allocate revenues, except shared revenues and property taxes, to residential and non-residential uses and estimate revenues associated with development using the same process

8. Estimate property taxes, state shared revenue, and total revenue associated with the new development

9. Compare estimated revenues and costs and determine the net fiscal impact on the community (Edwards, 2008)

Roe of the Ohio State Department of Agricultural, Environmental, and Development Economics (AEDE) estimated the fiscal impact analysis of newly constructed dairy farms in northwestern Ohio (Roe, 1). In this analysis, Roe analyzed the fiscal impact of the newly constructed dairies by examining the local Tax Increment Financing (TIF) agreements with the state government, monetary gifts to the counties in the region, fiscal impacts on local schools, the

change in road maintenance costs, projected revenues with and without the new dairies, inflation, and nominal and net present values. Roe used two separate counties and performed two separate analyses for comparative purposes (Roe, 2003).

2.10 Estimating Fiscal Impact Using IMPLAN

IMPLAN is used to estimate economic impact as well as fiscal impact (IMPLAN Professional Version 2.0 User's Guide 2004, 154). The IMPLAN model uses a local economy's industrial structure and labor market characteristics to calculate the impact of proposed economic development scenarios. IMPLAN populates fiscal impact analysis models with data from property type income, indirect business taxes, sales taxes, excise taxes, property taxes, government purchases, and the US Census Bureau Annual Survey of Government Finances (*The IMPLAN Input-Output System*, 2003).

IMPLAN estimates tax impacts, part of the overall fiscal impact analysis, using its Social Accounting Matrix (SAM) multipliers. Tax impacts are estimated by making two assumptions: (1) marginal changes (impacts) will use the same distribution as pictured in the base year social accounts and (2) the detail distribution of expenditures by Employment Compensation, Proprietor Income, Other Property Income, Indirect Business Taxes, and Enterprise Holds, no matter what the mix of affected industries (Introduction to IMPLAN, 2003). Once these assumptions are made, the fiscal impact can be analyzed. The literature on using IMPLAN for fiscal impact analysis is limited. IMPLAN was not used for fiscal impact analysis in this study, because it does

not analyze fiscal impacts at the county level or regional level, which were the levels of analysis used for this study.

CHAPTER 3

METHODOLOGY

3.1 Research Hypothesis

The research hypothesis for this study centered on the economic and fiscal impacts of an extended berry production season and expanded processing industry in three Appalachian Ohio communities. The main question addressed in this study was "How would an extended berry production season and expanded berry processing industry impact these three typical Appalachian Ohio communities?"

3.2 Purpose and Objectives

The purpose of this study was to estimate the economic and fiscal impacts of an extended berry production season and an expanded berry processing industry in three selected Appalachian Ohio communities. The following objectives were addressed:

1. Determine the net income associated with existing levels of berry production.
2. Determine the net income associated with existing levels of berry processing.
3. Estimate the economic impact of increased berry production in three regional case study economies.

4. Estimate the economic impact of increased berry processing in three regional case study economies.

5. Estimate the fiscal impact of increased berry production in three regional case study economies.

6. Estimate the fiscal impact of increased berry processing in three regional case study economies.

3.3 Study Communities

Highland County is an average sized community. Nearly 45% of residents are high school educated, 24% have no high school diploma, and 32% are college educated. Students in public secondary schools have a graduation rate of 87% and receive $8,109 from the government. There is only one two-year college. The tax base is 68% residential, with 18% in agriculture. Land is comprised of 53% cropland and 30% forested land. Rents are modest, with median gross rent at $434 per month. This is approximately 23% of gross income. Monthly owner-specified costs, such as mortgages, are also modest with the mean cost at $742 per month. This equates to approximately 20% of gross income. Employment was up to 20,300 in 2006 from 18,700 in 2002, an increase of 8.6%. Unemployment fluctuated but eventually remained the same during this time period. The unemployment rate was 5.6% in 2006, 0.1% below the state average. Sixty-one percent of employees have jobs in manufacturing, retail, and state and local

government. There was a decrease in both business starts and active businesses from 2002 to 2006.

The Highland region is comprised of the counties Adams, Brown, Clinton, Fayette, Highland, Pike, and Ross in Southern Ohio with a total population of slightly over 291,000 residents. Most residents are high school and college educated, and 24% do not have a high school diploma. There are 121 public schools with a graduation rate of 90%. Students in public schools receive $8,025 each from the state government per year. There are two private universities, one 4-year university branch campus, and one two-year public college. Sixty-six percent of the tax base is residential while 15% is agricultural and 13% is commercial. Land is comprised of 49% cropland and 37% forested land. The median gross rent is $441 per month, which is 23% of the household income in 1999. Median monthly owner-specified costs are $790 per month, which is 20% of the household income in 1999. Employment increased from 126,800 in the year 2002 to 134,300 in the year 2006, an increase of 6%. Unemployment decreased between these years from 9,300 people to 8,900 people, a decrease of 4%. The unemployment rate was at 6.4% in 2006, 0.7% above the statewide average. Most residents of Highland Region are employed in the manufacturing, retail, state and local government, accommodation and food services, and health care services. There were an additional 43 business starts in 2006, and active businesses also increased from 2002 to 2006.

According to IMPLAN data, in 2006 there were 82 people employed in the fruit farming sector in the Highland Region, with employee compensation totaling $501,000 and sales totaling

$912,000 (see Table 3.1). There was no fruit processing sector present in the Highland Region, so averages of the Morgan and Ross Regions were used to estimate berry processing in the Highland Region. As such, there were 1,268 employees in the fruit processing sector with wages totaling $45,366,500. Proprietor income totaled $105,500, and output was $358,318,500 (IMPLAN database).

Morgan County is a relatively small sized area with a population just over 14,000 residents. Roughly 50% of the residents have graduated from high school, 30% are college educated, and only 19% do not have a high school diploma. There are five public schools with a student population of 2,162. There are no private schools. Each student receives $9,286 from the state government per year. The graduation rate is 93%. No colleges or universities are present in Morgan County. Fifty percent of the tax base is residential, followed by 34% agricultural, and 12% commercial. Unlike the other study areas in this project, 86% of the land is forested. Only 4% of the land is agricultural and less than one percent is open for development. Monthly gross rents are low at $347 per month, which constitutes 24% of household income. Monthly owner-specified costs are also low at $650 per month and 19% of household income. Employment has decreased significantly from 6,000 jobs in 2002 to 5,300 jobs in 2006, a decrease of 12%. Unemployment has also decreased from 600 people in 2002 to 500 people in 2006, a decrease of 20%. This suggests a migration out of the study area. The unemployment rate was high at 9.1%, 3.4% above the statewide average. Twenty-five percent of residents are employed in state and local government, and 13% in manufacturing. There were negative employment figures in

agriculture, mining, utilities, transportation, management of companies, administrative services, educational services, arts and entertainment, and accommodation and food services. Business starts however, increased from 23 in 2002 to 42 in 2006. Active businesses decreased during this time frame.

The Morgan region is comprised of the counties Athens, Morgan, Muskingum, Noble, Perry, and Washington in Southern Ohio and has a population of 274,151 residents. Forty-three percent of the residents are high school graduates, 38.18% are college educated, and 18% do not have a high school diploma. There are 118 public schools with a student population of 45,784. Each student receives $8,541 from state government per year. The graduation rate is 92%. There is one 4-year university, two 4-year branch universities, three 2-year private colleges, and two private universities. The tax base is primarily residential, followed by commercial and agricultural. Land is 77% forested land, 11% cropland, and 10% pasture. Median monthly rents are $401, which is 25% of household income. Monthly owner-specified costs are $711, which is 19% of household income. Employment decreased from 123,400 jobs in 2002 to 122,500 jobs in 2006, a decrease of less than one percent. Unemployment decreased from 8,500 jobs in 2002 to 8,400 jobs in 2006, a decrease of one percent. The unemployment rate was 7.02% in 2006, 1.3% above the statewide average. Fifty-five percent of residents are employed in state and local government, manufacturing, retail, and health care services. Business starts were up from 564 in 2002 to 625 in 2006. Active businesses also increased from 5,499 in 2002 to 5,618 in 2006.

According to IMPLAN data, in 2006 Morgan Region employed 67 people in the fruit farming sector. Employee compensation in this sector totals $3.265 million, and sales total $200,000 (see Table 3.3). There are three employees in the fruit processing sector with wages totaling $47,000. Proprietor income is $1,000, and output is equal to $1,053,000.

Ross County is a larger community with a 2006 population of 75,556. Forty-two percent graduated from high school, 34% are college educated, and 24% do not have a high school diploma. There are twenty-seven public schools with a student population of 13,032. Each student receives $7,485 from the state each year, and the graduation rate in 93%. There is one 4-year branch university located in Ross County. The tax base is mainly residential and commercial. Land is comprised of 44% forested land and 38% cropland. The median gross rent is $430 per month, which is 22% of household income. Monthly owner-specified costs are $816, or 19% of household income. Employment increased from 31,700 jobs in 2002 to 32,600 jobs in 2006, a 3% increase. Unemployment decreased from 2,300 jobs in 2002 to 2,200 jobs in 2006, a 5% decrease. The unemployment rate was 6.2% in 2006, 0.5% above the statewide average. Sixty-six percent of residents are employed in state and local government, manufacturing, retail, and health care services. Business starts increased from 153 in 2002 to 161 in 2006. Additionally, active businesses increased from 1,335 in 2002 to 1,363 in 2006.

The Ross region is made up of the counties Fayette, Highland, Hocking, Jackson, Pickaway, Pike, Ross, and Vinton in Southern Ohio and has a total population of 304,604 residents. Nearly 44% have graduated from high school, 32% are college educated, and 24% do

not have a high school diploma. There are 126 public schools with a total of 53,486 students. The graduation rate is 91%, and each student receives $8,161 from the state government per year. There is one 2-year college and one 4-year branch university in the region. Sixty-nine percent of the tax base is residential, 14% is agricultural, and 12% is commercial. Forty-nine percent of the land is forested, 38% is cropland, and 11% is pasture. Median monthly gross rent is $432 per month, which is 24% of household income. Monthly owner-specified costs are $778, or 20% of household income. Employment increased from 129,600 jobs in 2002 to 134,100 jobs in 2006, a 3% increase. Unemployment decreased from 9,500 jobs in 2002 to 9,200 jobs in 2006, a decrease of 3%. The unemployment rate was 6.63% in 2006, 0.9% above the statewide average. Fifty-six percent of residents are employed in manufacturing, state and local government, and retail. Business starts and active businesses both increased from 2002 to 2006.

According to IMPLAN data, in 2006 there were 49 employees employed in the fruit farming sector in Ross Region. Employee compensation totals $1.732 million, and sales are approximately $600,000 (see Table 3.5). There are 2,533 employees in the fruit processing sector with wages totaling $90,686,000. Proprietor income is $210,000, and output is equal to $715,584,000.

3.4 Instrumentation

IMPLAN software and a one-page local government official questionnaire were used. IMPLAN software estimated the economic impacts of a change in berry production and a change in berry processing at the ten and twenty percent levels. The questionnaire was conducted face-to-face with county-level economic development directors and Ohio State University Extension Agents and included questions about the local tax structure and economic incentives for new and expanding businesses.

3.5 Data Analysis Using IMPLAN

IMPLAN software was used to build several models for each study region. A model was constructed for each study region increasing berry production from existing levels by 10% and 20%. A model was also constructed for each study region by increasing berry processing from existing levels by 10% and 20%. These percentages were arbitrarily chosen. Models were populated using data from the IMPLAN databases.

Economic impact analyses were performed using IMPLAN. Once the software was opened, a new model was constructed for each study region and saved under an appropriate name, such as 'Highland County' and 'Highland County Region'. Models were constructed using the SAM multipliers discussed in the IMPLAN section of this chapter and were populated with county-level data from the IMPLAN databases. To estimate the economic impacts of a ten and twenty percent increase in production and processing levels, the 'Impact' window of

IMPLAN was opened. To increase production and processing levels, the affected sector was selected, and the amount of increase was assigned. Each increase in production or processing levels was considered a 'new event' in the IMPLAN Impact section. Once these events were created, they were analyzed separately. Results were viewed subsequent to the impact analysis. The results window was opened from the main model window. To view general model info, the aptly named box was selected on first tab of the 'Results' window. To view results for value-added, employment, and output at the ten and twenty percent levels, each aptly named box was selected in the 'Impacts' tab along with the appropriate sector percent increase. Zeros were suppressed, and results were exported to Microsoft Excel files. Results were sorted in descending order by direct effect multipliers, and the top ten were used for this study. Sorting was conducted in Microsoft Excel.

3.6 Economic Analysis Using IMPLAN Software

Economic impacts of this study will be estimated using IMPLAN software developed by the Minnesota IMPLAN Group, Inc. The most recent version of software was published in 2002, with the most current data being released in 2004. The 2005 data set will be released in January 2008. Six IMPLAN models will be constructed: Highland county; the Highland county region, including Adams, Brown, Clinton, Fayette, Highland, Pike, and Ross counties; Morgan county; the Morgan county region, including Athens, Morgan, Muskingum, Noble, Perry, and Washington counties; Ross county; and the Ross county region, including Fayette, Highland, Hocking, Jackson, Pickaway, Pike, Ross, and Vinton counties. Models will be populated with

data from the IMPLAN databases. To calculate the direct, indirect, and induced economic effects of the project in each model, the model will be analyzed using SAM multipliers. Additionally, each model will be analyzed by changing output sales levels (assuming an expanded berry production/processing industry). Output sales levels will be changed by ten percent and then twenty percent.

After constructing the models, a report will be run using the IMPLAN software. Each report generated will give the aggregated and disaggregated impacts on surrounding industries. Disaggregated results will give much more detail as to which specific industries will gain or lose from an expanded berry season.

3.7 IMPLAN Software

IMPLAN (IMpact Analysis for PLANning) is an input-output software package developed by the Minnesota IMPLAN Group Inc. (MIG) in 1979. The software uses regional databases to construct descriptive and predictive input-output models. Once opened, IMPLAN allows the user to select the state, county, or counties to be included in the study area. In this project, two models are constructed for each region – descriptive and predictive. Descriptive models describe transfers of money between all institutions and industries. Predictive models include the set of input-output multipliers that predict total regional activity based on a change in consumption. Once the model is constructed, it can be viewed in the "Report" section of the program.

IMPLAN databases are compiled annually by MIG, with the most current database released in February 2008 (includes data for 2006). Databases have six main components: employment, value added, output, institutional demand, inter-institutional transfers, and national structural matrices. There are 509 industrial/commodity sectors. All U.S. states and counties are included as well as zip code areas. Databases are compiled from several public sources: Bureau of Labor Statistics Covered Wages, Bureau of Economic Analysis Regional Economic Information System, US Census of Agriculture, US Census of Construction, Census Annual Survey of Government Finances, and the Federal Data Procurement Center.

Multipliers are used to estimate the impact of a change in an industry. IMPLAN uses three types of multipliers: Type I, Type II, and SAM (Social Accounts Matrix). Type I multipliers give direct and indirect effects. Type II multipliers are direct, indirect, and induced effects where the induced effect is based on income (IMPLAN Professional Version 2.0). Finally, SAM multipliers include the direct, indirect, and induced effects where the induced effect is based on information in the social accounts matrix. Models constructed using SAM multipliers can include any institutions chosen by the model builder. Model customizing is allowed in IMPLAN, but this requires altering the datasets. Once changes are made to the datasets, they cannot be undone, so customization must be done with extreme caution. Output multipliers are a common tool in estimating potential economic impact. A multiplier summarizes the total impact that can be expected from change in a given economic activity (Miller, 1). They are essentially simple ratios of total to initial change. There are four multipliers typically used to estimate

economic impact. These include output, employment, income and value added multipliers. Output multipliers estimate the total change in sales. Employment multipliers measure the total change in employment. Income multipliers measure the total increase in income in the study area resulting from a one dollar increase in income received by workers in the exporting industry (Miller, 1). Finally, value added multipliers estimate the additional value added to the product as a result of economic activity. Multipliers are calculated using direct, indirect, and induced effects. Direct effects are production changes associated with the immediate effects or final demand changes. Indirect effects are production changes in backwards linked industries caused by the changing input needs of directly affected industries. Lastly, induced effects are the changes in regional household spending patterns caused by changes in household income generated from the direct and indirect effects.

Following the construction of a model, results can be viewed in the IMPLAN Reports section. Study area reports include output, value-added, and employment; institution commodity demand; household commodity demand; government commodity demand; institution commodity sales; general model information; IMPLAN to Standard Industrial Classification codes; type codes; and an aggregation template. Social accounts reports include an industry balance sheet report; commodity balance sheet report; commodity summary; commodity trade report; institution local commodity demand; household local commodity demand; government local commodity demand; industry summary; industries and commodities in the model; industry import matrix; and an institution import matrix. Social accounting matrix (SAM) reports consist of

aggregate SAM; various industry-by-commodity SAM reports; and a 26 file CGE format. Industry-by-industry reports are comprised of institution industry demand; household industry demand; government industry demand; industry output/outlay summaries; aggregate industry-by-industry SAM; regional industry-by-industry direct coefficients report; regional industry-by-industry transactions report; and various industry-by-industry SAM reports. Additionally, there are multiplier reports and impact reports to further analyze the data.

3.8 Fiscal Analysis: Surveys of Local Government Officials

Fiscal analysis for this project was conducted following the personal interview structure, as set forth by Cooper and Schindler (Cooper and Schindler, 323-326). Personal interviews were conducted in Highland, Morgan, and Ross counties with the Economic Development Director and the local OSU Extension Educator. Responses were recorded on paper. Interviews were prescheduled, face-to-face, and the interviewer controlled the personal interview. Each interviewee was contacted via telephone to set up an appropriate time to meet in person. Interviews were conducted in each interviewee's respective county. Interviewers (Rebecca Smith and Dr. Gregory Davis) drove to each location on the set appointment dates and conducted the interviews in person. Interviewers spent approximately one hour with each subject. Data were collected using the questions below. Fiscal analyses utilizing the data collected were conducted from January 2008-March 2008.

1. Do you have your county's millage rates published in a format that could be made accessible to us?

2. What tax incentive programs are used in your county? Have you used or do you envision using these programs with a potential expanding or relocating food processor? An expanding or relocating berry processor?

3. If economic zoning is used, what is the typical or average abatement level or percentage used?

4. Do you have a revolving loan fund (RLF)? If so, would you envision or have you used a RLF to help a processor or producer to locate or expand in your community?

5. Do you have a site suitable for a new or expanding berry processor? If not, what infrastructure improvements will be necessary to accommodate such a prospect? Can you estimate the costs associated with the needed infrastructure improvements?

In a similar study, such data collection methods were employed in 2003 by Brian Roe of Ohio State University. Roe's study methods were emulated in this study. In Roe's report on seven recently constructed dairies in Van Wert and Paulding counties in Ohio, fiscal analysis was incremental or marginal in that the interest was in the new costs and new revenues that arise for local governments and school districts because of the recently constructed dairies (Roe, 18). Revenues in these counties came from two main sources: additional real property tax collections on the dairies and funds obtained by the counties from external sources. Roe's analysis also

focused on the fiscal effects of additional road costs associated with the new dairies, additional property tax revenues, and external funding received across all government entities for a 30-year horizon. Separate analyses were conducted for each county. Additionally, Tax Increment Financing (TIF) agreements were studied. Such agreements are used to help distribute new taxes generated by companies across various government entities. Inflation was also taken into consideration, as well as nominal and net present values. Like Roe's study, this study employed personal interviews of local officials to obtain information about local tax structures and tax incentives for new or expanding businesses. This study also focused on gathering information about TIF's and RLF's.

Moreover, because there are no berry processors in Highland, Morgan, or Ross counties, two processors in other parts of Ohio were used to inform the range of potential impact. Smuckers is located in Orrville, Ohio and is a large processing plant. Smuckers had an employment FTE of 3,025 in 2007. Its annual net sales were $1,547.1 million (*Smuckers Annual Report 2007,* 2). Cooper's, located in Bucyrus, Ohio, is a much smaller processing plant. Its annual employment FTE was 6-7 FTE's in 2007. Its estimated annual gross sales were between $500,000 and $700,000. For the purposes of this study, a level of processing employment comparable in size to Cooper's was used to estimate the potential economic and fiscal impacts of additional new processing employment resulting from additional berry production in the study regions.

CHAPTER 4

FINDINGS

4.1 Research Hypothesis

The research hypothesis for this study centered on the economic and fiscal impacts of an extended berry production season and expanded processing industry in three Appalachian Ohio communities. The main question addressed in this study was "How would an extended berry production season and expanded berry processing industry impact these three typical Appalachian Ohio communities?"

4.2 Purpose and Objectives

The purpose of this study was to estimate the economic and fiscal impacts of an extended berry production season and an expanded berry processing industry in three selected Appalachian Ohio communities. The following objectives were addressed:

1. Determine the net income associated with existing levels of berry production.
2. Determine the net income associated with existing levels of berry processing.
3. Estimate the economic impact of increased berry production in three regional case study economies.

4. Estimate the economic impact of increased berry processing in three regional case study economies.

5. Estimate the fiscal impact of increased berry production in three regional case study economies.

4.3 Study Limitations

Economic impact analyses attempt to estimate how a change in final demand of one sector of the economy will affect the economy as a whole. Economic impact analysis is an *estimate* and not a guaranteed set of figures. While it provides an estimate of the effects of a new development or project, it cannot give exact details of what will happen as a result of this investment or disinvestment.

Fiscal impact analyses can be tailored to any community and can include a number of components, both an attribute and a limitation. There is no single formula or combination of components to comprise a fiscal impact analysis, and the analysis depends on the characteristics of the community in question, which will differ from community to community. Furthermore, a fiscal impact analysis requires extensive data to yield refined estimates (Harrison and French, 2004). Most simple forms of fiscal impact analysis fail to incorporate variation in the costs of providing services over space. Despite these limitations, fiscal impact analyses are usually able to provide a much more refined estimate because of their use of stratified analyses.

This study examined three Appalachian Ohio communities – Highland Region, Morgan Region, and Ross Region – and its findings are generalizable to these communities only. Data used were current for the year 2006. Furthermore, the study used arbitrary berry production increases of 10% and 20%. Berry production increases would not necessarily occur in such increments and therefore must only be taken for the estimates that they are. Arbitrary figures were used to estimate the impact of a small berry processing facility entering the study regions. A new or expanding berry processor may employ more or less than the FTE's used in this study. Processing facilities were not present in the Highland Region, so averages were taken from the Morgan and Ross Regions estimate processing impacts in the Highland Region. As with the situation of the hypothetical processor, berry processing in the Highland Region will not necessarily look like what this study suggested.

4.4 Net Income Associated With Existing Levels of Berry Production

Net income associated with existing levels of berry production was determined by examining the existing levels of proprietor income within IMPLAN. Total proprietor income in the Highland Region was $425.7 million. An estimated $17,216 in additional new proprietor income would result from a 10% increase in berry production. A 20% increase in berry production would add an estimated $34,432 in new proprietor income. Total proprietor income in the Morgan Region was $300.3 million. An estimated $27,019 in additional new proprietor income would result from a 10% increase in berry production. A 20% increase in berry production would add an estimated $54,037 in new proprietor income. Total proprietor income in

the Ross Region was $408.3 million. An estimated $16,293 in additional new proprietor income would result from a 10% increase in berry production. A 20% increase in berry production would add an estimated $42,587 in new proprietor income (See Appendix C).

4.5 Net Income Associated With Existing Levels of Berry Processing

Net income associated with existing levels of berry processing was determined by examining the existing levels of proprietor income within IMPLAN. Total proprietor income in the Highland Region was $425.7 million. An estimated $11,000 in new proprietor income would result from adding 6 FTEs to berry processing to the region. Total proprietor income in the Morgan Region was $300.3 million. An estimated $1,000 in new proprietor income would result from adding 6 FTEs to berry processing to the region. Total proprietor income in the Ross Region was $408.3 million. An estimated $21,000 in new proprietor income would result from adding 6 FTEs to berry processing to the region. (See Appendix C).

4.6 Estimated Economic Impacts of Increased Berry Production

In the Highland Region, existing employment was 132,075 FTEs; total employee compensation was $4.5 billion; total proprietor income was $425.7 million, and; output, or sales, was $16.4 billion. In the Morgan Region, existing employment was 115,118 FTEs; total employee compensation was $3.6 billion; proprietor income totaled $300.3 million, and; output, or sales, was $12.8 billion. In the Ross Region, existing employment was 120,617 FTEs; total employee compensation was $4.08 billion; proprietor income totaled $408.3 million, and; output,

or sales, was $16.2 billion (Appendix H). A 20% increase in berry production would impact employment, employment compensation, proprietor income and sales within the region. Table 4.1 illustrates the 10 most impacted sectors (by region) in terms of annual impact to sales, employee compensation, and proprietor income resulting from a 20% production increase. Table 4.2 illustrates the 10 most impacted sectors (by region) in terms of employment impact.

Total Estimated Annual Impact* of Production Increase of 20% - 10 Most Impacted Sectors						
	Highland Region		Morgan Region		Ross Region	
Rank	Sector	Impact	Sector	Impact	Sector	Impact
1	Fruit farming	$711,251	Fruit farming	$1,106,053	Fruit farming	$731,803
2	Agriculture and forestry support services	$55,694	Accounting and bookkeeping services	$43,798	Agriculture and forestry support activities	$27,166
3	Owner-occupied dwellings	$21,101	Petrochemical manufacturing	$16,916	Owner-occupied dwellings	$22,286
4	Truck transportation	$13,290	Owner-occupied dwellings	$16,551	Food services and drinking places	$10,568
5	Food services and drinking places	$9,901	Real estate	$12,385	Offices of physicians-dentists-and other health	$8,749
6	Offices of physicians-dentists-and other health	$8,354	Offices of physicians-dentists-and other health	$12,299	Hospitals	$8,170
7	Hospitals	$6,966	Wood container and pallet manufacturing	$10,451	Real estate	$7,654
8	Real estate	$6,360	Truck transportation	$10,054	Monetary authorities and depository credit services	$6,929
9	Monetary authorities and depository credit services	$5,061	Hospitals	$9,410	Wood container and pallet manufacturing	$5,942
10	Other state and local government enterprises	$4,699	Other state and local government enterprises	$8,506	Other state and local government enterprises	$5,541

*Sum of estimated employee compensation, output, and proprietor income impacts

Table 4.1 Total Estimated Annual Impact of 20% Production Increase: 10 Most Impacted Sectors

Total Estimated Annual Employment Impact of Production Increase of 20% - 10 Most Impacted Sectors						
	Highland Region		Morgan Region		Ross Region	
Rank	Sector	Impact	Sector	Impact	Sector	Impact
1	Fruit farming	16.42	Fruit farming	13.43	Fruit farming	9.80
2	Agriculture and forestry Support services	0.87	Agriculture and forestry support services	0.84	Agriculture and forestry support services	0.49
3	Food services and Drinking places	0.12	Food services and drinking places	0.10	Food services and drinking places	0.13
4	Animal production	0.05	Real estate	0.07	General merchandise stores	0.04
5	Cattle ranching and farming	0.05	Warehousing and storage	0.05	Real estate	0.04
6	General merchandise stores	0.04	Health offices	0.05	Nursing and residential care facilities	0.04
7	Food and beverage stores	0.04	Wood container and pallet manufacturing	0.05	Food and beverage stores	0.04
8	Nursing and residential care facilities	0.04	Hospitals	0.05	Health offices	0.04
9	Health offices	0.04	Truck transportation	0.04	Civic organizations	0.04
10	Oilseed farming	0.04	Civic organizations	0.04	Grain farming	0.04

Table 4.2 Total Estimated Annual Employment Impact of 20% Production Increase: 10 Most Impacted Sectors

4.7 Estimated Economic Impacts of Increased Berry Processing

In the Highland Region, existing employment was 132,075 FTEs; total employee compensation was $4.5 billion; total proprietor income was $425.7 million, and; output, or sales, was $16.4 billion. In the Morgan Region, existing employment was 115,118 FTEs; total employee compensation was $3.6 billion; proprietor income totaled $300.3 million, and; output, or sales, was $12.8 billion. In the Ross Region, existing employment was 120,617 FTEs; total employee compensation was $4.08 billion; proprietor income totaled $408.3 million, and; output, or sales, was $16.2 billion (Appendix D). Adding 6 FTEs in the berry processing sector would

impact employment, employment compensation, proprietor income and sales within the region. Table 4.3 illustrates the 10 most impacted sectors (by region) in terms of annual impact to sales, employee compensation, and proprietor income resulting from the addition of 6 FTEs in berry processing. Table 4.4 illustrates the 10 most impacted sectors (by region) in terms of employment impact. (Note: According to the IMPLAN database, there were no sales in the fruit processing sector in the Highland Region in 2006. Therefore, Highland Region processing effects throughout this study were calculated using the average of the Morgan Region and Ross Region processing effects.)

Total Estimated Annual Impact* of Processing Increase of 6 FTEs - 10 Most Impacted Sectors						
	Highland Region		Morgan Region		Ross Region	
Rank	Sector	Impact	Sector	Impact	Sector	Impact
1	Fruit and vegetable canning and drying	$2,333,103	Fruit and vegetable canning and drying	$2,333,103	Truck transportation	$90,100
2	Frozen food manufacturing	$1,914,266	Truck transportation	$201,390	Owner-occupied dwellings	$29,530
3	Truck transportation	$291,490	Glass container manufacturing	$61,871	Management of companies and enterprises	$28,387
4	Wholesale trade	$71,631	Wholesale trade	$45,370	Wholesale trade	$26,738
5	Management of companies and enterprises	$58,100	Fruit farming	$35,503	Meat processed from carcasses	$25,930
6	Owner-occupied dwellings	$57,582	Plastics manufacturing	$33,134	Monetary authorities	$23,192
7	Monetary authorities	$53,919	Monetary authorities	$31,176	Food services and drinking places	$20,857
8	Fruit farming	$35,503	Power generation and supply	$30,548	Animal slaughtering	$19,729
9	Warehousing and storage	$16,718	Management of companies and enterprises	$29,713	Plastics manufacturing	$16,535
10	Health offices	$11,678	Owner-occupied dwellings	$28,052	Warehousing and storage	$7,435

*Sum of estimated employee compensation, output, and proprietor income impacts

Table 4.3 Total Estimated Annual Impact of 6 FTE Processing Increase: 10 Most Impacted Sectors

Total Estimated Annual Employment Impact of Processing Increase of 6 FTEs - 10 Most Impacted Sectors						
	Highland Region		Morgan Region		Ross Region	
Rank	Sector	Impact	Sector	Impact	Sector	Impact
1	Frozen food manufacturing	6.01	Fruit and vegetable canning and drying	6.00	Frozen food manufacturing	6.01
2	Fruit and vegetable canning and drying	6.00	Truck transportation	1.32	Truck transportation	0.59
3	Truck transportation	1.91	Fruit farming	0.68	Food services and drinking places	0.38
4	Food services and drinking places	0.82	Food services and drinking places	0.44	Warehousing and storage	0.20
5	Fruit farming	0.68	Warehousing and storage	0.30	Employment services	0.16
6	Warehousing and storage	0.50	Wholesale trade	0.26	General merchandise stores	0.16
7	Wholesale trade	0.41	Civic organizations	0.19	Wholesale trade	0.15
8	Civic organizations	0.34	Monetary authorities	0.16	Cattle ranching and farming	0.15
9	Monetary authorities	0.16	Management of companies and enterprises	0.16	Food and beverage stores	0.15
10	Employment services	0.16	Glass container manufacturing	0.16	Civic organizations	0.15

Table 4.4 Total Estimated Annual Employment Impact of 6 FTE Processing Increase: 10 Most Impacted Sectors

4.8 Estimated Fiscal Impact of Increased Berry Production and Processing

4.8.1 Purpose and Objectives

The purpose of this study was to estimate the fiscal impacts of increased berry production and an expanded berry processing industry. Fiscal impact analysis is defined as being the difference between revenues and expenditures generated by the proposed development scenario. For the purposes of this study, fiscal impacts of potential increases in berry production and processing were estimated considering the financial burden to local governments (including schools) resulting from an increase in berry production and processing in Highland, Morgan, and

Ross counties in relation to financial gains to these local governments via property taxes and income taxes associated with an increase in berry production and processing in Highland, Morgan, and Ross counties. A comparison of annual impact is illustrated in Table 4.5.

4.8.2 Fiscal Impact of Increased Berry Production in Highland County

Estimated fiscal impacts of increased berry production in Highland County were deemed negligible. A 20% increase in berry production sales in Highland County would result in nominal costs to local governments and negligible new income.

The financial burden to local governments (including schools) in Highland County resulting from an increase in berry production in Highland County was deemed negligible. Expenses associated with increased berry production would be negligible based on the assumption that land currently used for agricultural production would be used for increased berry production. That is, there would be no net change in land used for agricultural production, and therefore no change in costs to provide services to such a land use. Additionally, neither development incentives nor infrastructure would be extended by Highland County that would adversely affect county government finances (including schools) in order to expand berry production in Highland County.

The financial gains to these local governments in Highland County (including schools) via property taxes and income taxes associated with an increase in berry production in Highland County were of nominal significance. Estimated new property tax revenues associated with

increased berry production would be negligible based on the assumption that land currently used for agricultural production would be used for increased berry production. Land valuation would change very little, if at all and therefore property tax revenues would remain relatively consistent with current levels. Income tax rates levied by public schools are 1.0 to 1.25%. A 20% increase in berry production sales in Highland County would result in additional school income tax collections of $92 to $115 annually.

4.8.3 Fiscal Impact of Increased Berry Processing in Highland County

Estimated fiscal impacts of increased berry processing in Highland County were deemed insignificant. Creation of 6 FTEs in berry processing in Highland County would result in nominal costs to local governments and relatively insignificant new income.

In Highland County, the financial burden to local governments (including schools) resulting from the creation of 6 FTEs in berry processing in Highland County was deemed negligible. Additionally, neither development incentives nor infrastructure would be extended by Highland County that would adversely affect county government finances (including schools) in order to create a berry processing industry in Highland County. Costs to schools (pupil costs) associated with the creation of 6 FTEs to Highland County were deemed negligible.

The financial gains to these local governments in Highland County (including schools) via property taxes and income taxes associated with the creation of 6 FTEs in berry processing in Highland County were relatively insignificant. Estimated new property tax revenues associated

with a berry processing facility ranged from $3957-$4777 annually. Creation of berry processing employment in Highland County (income taxes levied by public schools are 1.0% to 1.25%) would result in estimated additional school income tax collections of $3074 to 3843 annually.

4.8.4 Fiscal Impact of Increased Berry Production in Morgan County

Estimated fiscal impacts of increased berry production in Morgan County were deemed negligible. A 20% increase in berry production sales in Morgan County would result in nominal costs to local governments and relatively insignificant new income.

The financial burden to local governments (including schools) in Morgan County resulting from an increase in berry production in Morgan County was deemed negligible. Expenses associated with increased berry production would be negligible based on the assumption that land currently used for agricultural production would be used for increased berry production. That is, there would be no net change in land used for agricultural production, and therefore no change in costs to provide services to such a land use. Additionally, neither development incentives nor infrastructure would be extended by Morgan County that would adversely affect county government finances (including schools) in order to expand berry production in Morgan County.

The financial gains to these local governments in Morgan County (including schools) via property taxes and income taxes associated with an increase in berry production in Morgan County were of nominal significance. Estimated new property tax revenues associated with

increased berry production would be negligible based on the assumption that land currently used for agricultural production would be used for increased berry production. Land valuation would change very little, if at all and therefore property tax revenues would remain relatively consistent with current levels. Income taxes are not currently levied by the public schools in Morgan County. Therefore, a 20% increase in berry production sales in Morgan County would generate an estimated $23,983 in additional new income, yet yield no income tax revenue to the schools.

4.8.5 Fiscal Impact of Increased Berry Processing in Morgan County

Estimated fiscal impacts of increased berry processing in Morgan County were deemed insignificant. Creation of 6 FTEs in berry processing in Morgan County would result in nominal costs to local governments and relatively insignificant new income.

In Morgan County, the financial burden to local governments (including schools) resulting from the creation of 6 FTEs in berry processing in Morgan County was deemed negligible. Additionally, neither development incentives nor infrastructure would be extended by Morgan County that would adversely affect county government finances (including schools) in order to create a berry processing industry in Morgan County. Costs to schools (pupil costs) associated with the addition of 6 FTEs to Morgan County were deemed negligible.

The financial gains to these local governments in Morgan County (including schools) via property taxes and income taxes associated with the creation of 6 FTEs in berry processing in Morgan County were relatively insignificant. Estimated new property tax revenues associated

with a berry processing facility ranged from $4312-$4808 annually. An increase in berry processing employment in Morgan County would result in an estimated $307,000 in additional new income but provide no additional school income tax collections as income taxes are not currently levied by the public schools in Morgan County.

4.8.6 Fiscal Impact of Increased Berry Production in Ross County

Estimated fiscal impacts of increased berry production in Ross County were deemed negligible. A 20% increase in berry production sales in Ross County would result in nominal costs to local governments and relatively insignificant new income.

The financial burden to local governments (including schools) in Ross County resulting from an increase in berry production in Ross County was deemed negligible. Expenses associated with increased berry production would be negligible based on the assumption that land currently used for agricultural production would be used for increased berry production. That is, there would be no net change in land used for agricultural production, and therefore no change in costs to provide services to such a land use. Additionally, neither development incentives nor infrastructure would be extended by Ross County that would adversely affect county government finances (including schools) in order to expand berry production in Ross County.

The financial gains to these local governments in Ross County (including schools) via property taxes and income taxes associated with an increase in berry production in Ross County were of nominal significance. Estimated new property tax revenues associated with increased

berry production would be negligible based on the assumption that land currently used for agricultural production would be used for increased berry production. Land valuation would change very little, if at all and therefore property tax revenues would remain relatively consistent with current levels. Income tax rates levied by public schools are 0.5 to 1.0%. A 20% increase in berry production sales in Ross County would result in additional school income tax collections of $203 to $407 annually.

4.8.7 Fiscal Impact of Increased Berry Processing in Ross County

Estimated fiscal impacts of increased berry processing in Ross County were deemed insignificant. Creation of 6 FTEs in berry processing in Ross County would result in nominal costs to local governments and relatively insignificant new income.

In Ross County, the financial burden to local governments (including schools) resulting the creation of 6 FTEs in berry processing in Ross County was deemed negligible. Additionally, neither development incentives nor infrastructure would be extended by Ross County that would adversely affect county government finances (including schools) in order to create a berry processing industry in Ross County. Costs to schools (pupil costs) associated with the addition of 6 FTEs to Ross County were deemed negligible.

The financial gains to these local governments in Ross County (including schools) via property taxes and income taxes associated with the creation of 6 FTEs in berry processing in Ross County were relatively insignificant. Estimated new property tax revenues associated with a

berry processing facility ranged from $4630-5806 annually. Creation of berry processing employment in Ross County (income taxes levied by public schools are 0.5% to 1.0%) would result in estimated additional school income tax collections of $1537 to $3074 annually.

4.9 Summary of Estimated Fiscal Impact of Increased Berry Production and Processing

Estimated fiscal impacts of additional berry production sales and creation of a berry processing industry in Highland, Morgan, and Ross counties considered a negligible financial burden to local governments (including schools). Revenues to these local governments (including schools) considered existing property tax rates and school income tax rates in Highland and Ross counties. (Public schools in Morgan County collect no school income tax.) Estimated new annual revenues were relatively insignificant. A summary comparison of estimated annual fiscal impact is illustrated in Table 4.5.

	Annual Estimated Fiscal Impact	
	Production	**Processing**
Highland	$92-$115	$7031-$8620
Morgan	$0	$4312-$4808
Ross	$203-$407	$6167-$8880

Table 4.5 Annual Estimated Fiscal Impact by Region

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The purpose of this study was to estimate the economic and fiscal impacts of an extended berry production season and expanded berry processing industry in three Appalachian Ohio communities. In addition, the purpose of this study was to determine whether or not an extended berry production season and expanded berry processing industry would be a viable community economic development option. Economic impact models were constructed using IMPLAN software and IMPLAN databases current for the year 2006. Personal interviews were conducted January through March of 2008 with Ohio State University Extension Educators and Economic Development Directors to inform the calculations used to estimate fiscal impacts. Economic multipliers were used to estimate the economic impacts of an extended berry production season and expanded processing sector.

5.2 Net Income Associated With Increased Levels of Berry Production

A 10% increase in berry production added $17,216 to the Highland Region economy, $27,019 to the Morgan Region economy, and $16, 293 to the Ross Region economy. This was less than a one percent increase for all three regions. A 20% increase in berry production added

$34,432 to the Highland Region economy, $54,037 to the Morgan Region economy, and $42,587 to the Ross Region economy. This was also a less than one percent increase for all three regions.

5.3 Net Income Associated With Increased Levels of Berry Processing

A 6 FTE increase in berry processing added $11,000 to the Highland Region economy, $1,000 to the Morgan Region economy, and $21,000 to the Ross Region economy. This was less than a one percent increase for all three regions.

5.4 Estimated Economic Impact of Increased Berry Production

5.4.1 Highland Region

Employment: For the total Highland Region economy, the overall employment increase resulting from increased berry production was negligible (<1%). The employment multiplier for the berry production sector was 1.12, which was below the mean employment multiplier of 1.72 among all sectors in the region.

Employee Compensation: For the total Highland Region economy, the overall increase in employee compensation resulting from increased berry production was negligible (<1%). The employee compensation multiplier for the berry production sector was 1.35, which was below the mean employee compensation multiplier of 1.59 among all sectors in the region.

Proprietor Income: For the total Highland Region economy, the overall increase in proprietor income resulting from increased berry production was negligible (<1%). The proprietor income

multiplier for the berry production sector was 1.38, which was below the mean proprietor income multiplier of 9.81 among all sectors in the region.

Output: For the total Highland Region economy, the overall increase in output resulting from increased berry production was negligible (<1%). The output multiplier for the berry production sector was 1.35, which was equal to the mean output multiplier among all sectors in the region.

Top 10 Most Affected Economic Sectors: The top 10 economic sectors most affected by increased berry production in the Highland Region were fruit farming, agriculture and forestry support services, owner-occupied dwellings, truck transportation, food services and drinking places, health offices, hospitals, real estate, monetary authorities, and other state government enterprises. Sectors were ranked according to the total dollar effect to employment, employee compensation, proprietor income, and output.

5.4.2 Morgan Region

Employment: For the total Morgan Region economy, the overall increased employment due to increased berry production was negligible (<1%). The employment multiplier for the berry production sector was 1.16, which was below the mean employment multiplier of 1.83 among all sectors in the region.

Employee Compensation: For the total Morgan Region economy, the overall increased employee compensation due to increased berry production was negligible (<1%). The employee

compensation multiplier for the berry production sector was 1.96, which was below the mean employee compensation multiplier of 2.77 among all sectors in the region.

Proprietor Income: For the total Morgan Region economy, the overall increased proprietor income due to increased berry production was negligible (<1%). The proprietor income multiplier for the berry production sector was 1.17, which was below the mean proprietor income multiplier of 35.82 among all sectors in the region.

Output: For the total Morgan Region economy, the overall increased output due to increased berry production was negligible (<1%). The output multiplier for the berry production sector was 1.23, which was below the mean output multiplier of 1.42 among all sectors in the region.

Top 10 Most Affected Economic Sectors (Sum of Employment, Employee Compensation, Proprietor Income, and Output): The top 10 economic sectors most affected by increased berry production in the Morgan Region were fruit farming, accounting and bookkeeping services, petrochemical manufacturing, owner-occupied dwellings, real estate, health offices, wood container and pallet manufacturing, truck transportation, hospitals, and other state government enterprises. Sectors were ranked according to the total dollar effect to employment, employee compensation, proprietor income, and output.

5.4.3 Ross Region

Employment: For the total Ross Region economy, the overall increased employment due to increased berry production was negligible (<1%). The employment multiplier for the berry

production sector was 1.16, which was below the mean employment multiplier of 1.69 among all sectors in the region.

Employee Compensation: For the total Ross Region economy, the overall increased employee compensation due to increased berry production was negligible (<1%). The employee compensation multiplier for the berry production sector was 1.23, which was below the mean employee compensation multiplier of 2.60 among all sectors in the region.

Proprietor Income: For the total Ross Region economy, the overall increased proprietor income due to increased berry production was negligible (<1%). The proprietor income multiplier for the berry production sector was 1.33, which was below the mean proprietor income multiplier of 13.53 among all sectors in the region.

Output: For the total Ross Region economy, the overall increased output due to increased berry production was negligible (<1%). The output multiplier for the berry production sector was 1.33, which was below the mean output multiplier of 1.34 among all sectors in the region.

Top 10 Most Affected Economic Sectors (Sum of Employment, Employee Compensation, Proprietor Income, and Output): The top 10 economic sectors most affected by increased berry production in the Ross Region were fruit farming, agriculture and forestry support services, owner-occupied dwellings, food services and drinking places, health offices, hospitals, real estate, monetary authorities, wood container and pallet manufacturing, and other state government

enterprises. Sectors were ranked according to the total dollar effect to employment, employee compensation, proprietor income, and output.

5.5. Estimated Economic Impact of Increased Berry Processing

5.5.1 Highland Region

Employment: For the total Highland Region economy, the overall increased employment due to increased berry processing was negligible (<1%). The employment multiplier for the berry processing sector was 2.08, which was above the mean employment multiplier of 1.72 among all sectors in the region.

Employee Compensation: For the total Highland Region economy, the overall increased employee compensation due to increased berry processing was negligible (<1%). The employee compensation multiplier for the berry processing sector was 2.32, which was above the mean employee compensation multiplier of 1.59 among all sectors in the region.

Proprietor Income: For the total Highland Region economy, the overall increased proprietor income due to increased berry processing was negligible (<1%). The proprietor income multiplier for the berry processing sector was 39.97, which was above the mean proprietor income multiplier of 9.81 among all sectors in the region.

Output: For the total Highland Region economy, the overall increased output due to increased berry processing was negligible (<1%). The output multiplier for the berry processing sector was 1.34, which was below the mean output multiplier of 1.35 among all sectors in the region.

Top 10 Most Affected Economic Sectors (Sum of Employment, Employee Compensation, Proprietor Income, and Output): The top 10 economic sectors most affected by increased berry processing in the Highland Region were fruit and vegetable canning and drying, frozen food manufacturing, truck transportation, wholesale trade, management of companies and enterprises, owner-occupied dwellings, monetary authorities, fruit farming, warehousing and storage, and health offices. Sectors were ranked according to the total dollar effect to employment, employee compensation, proprietor income, and output.

5.5.2 Morgan Region

Employment: For the total Morgan Region economy, the overall increased employment due to increased berry processing was negligible (<1%). The employment multiplier for the berry processing sector was 2.33, which was above the mean employment multiplier of 1.83 among all sectors in the region.

Employee Compensation: For the total Morgan Region economy, the overall increased employee compensation due to increased berry processing was negligible (<1%). The employee compensation multiplier for the berry processing sector was 3.07, which was above the mean employee compensation multiplier of 2.77 among all sectors in the region.

Proprietor Income: For the total Morgan Region economy, the overall increased proprietor income due to increased berry processing was negligible (<1%). The proprietor income

multiplier for the berry processing sector was 33.51, which was below the mean proprietor income multiplier of 35.82 among all sectors in the region.

Output: For the total Morgan Region economy, the overall increased output due to increased berry processing was negligible (<1%). The output multiplier for the berry processing sector was 1.38, which was above the mean output multiplier of 1.42 among all sectors in the region.

Top 10 Most Affected Economic Sectors (Sum of Employment, Employee Compensation, Proprietor Income, and Output): The top 10 economic sectors most affected by increased berry processing in the Morgan Region were fruit and vegetable canning and drying, truck transportation, glass container manufacturing, wholesale trade, fruit farming, plastics, monetary authorities, power generation and supply, management of companies and enterprises, and owner-occupied dwellings. Sectors were ranked according to the total dollar effect to employment, employee compensation, proprietor income, and output.

5.5.3 Ross Region

Employment: For the total Ross Region economy, the overall increased employment due to increased berry processing was negligible (<1%). The employment multiplier for the berry processing sector was 1.83, which was above the mean employment multiplier of 1.69 among all sectors in the region.

Employee Compensation: For the total Ross Region economy, the overall increased employee compensation due to increased berry processing was negligible (<1%). The employee

compensation multiplier for the berry processing sector was 1.57, which was below the mean employee compensation multiplier of 2.60 among all sectors in the region.

Proprietor Income: For the total Ross Region economy, the overall increased proprietor income due to increased berry processing was negligible (<1%). proprietor income multiplier for the berry processing sector was 46.44, which was above the mean proprietor income multiplier of 13.53 among all sectors in the region.

Output: For the total Ross Region economy, the overall increased output due to increased berry processing was negligible (<1%). The output multiplier for the berry processing sector was 1.30, which was below the mean output multiplier of 1.34 among all sectors in the region.

Top 10 Most Affected Economic Sectors (Sum of Employment, Employee Compensation, Proprietor Income, and Output): The top 10 economic sectors most affected by increased berry processing in the Morgan Region were truck transportation, owner-occupied dwellings, management of companies and enterprises, wholesale trade, meat processed from carcasses, monetary authorities, food services and drinking places, animal slaughtering, plastics, and warehousing and storage. Sectors were ranked according to the total dollar effect to employment, employee compensation, proprietor income, and output.

5.6 Estimated Fiscal Impact of Increased Berry Production

5.6.1 Highland Region

Real Property Tax Impact: Tax impacts for increased berry production in the Highland Region were estimated to be negligible based on a series of assumptions.

Personal Income Tax Impact: Costs were estimated to be negligible based on a series of assumptions. Income taxes to the schools were estimated to be $421 at the 0.5% income tax rate and $843 at the 1.0% income tax rate.

5.6.2 Morgan Region

Real Property Tax Impact: Tax impacts for increased berry production in the Morgan Region were estimated to be negligible based on a series of assumptions.

Personal Income Tax Impact: Costs were estimated to be negligible based on a series of assumptions. Income taxes to the schools were estimated to be $345 at the 0.5% income tax rate and $691 at the 1.0% income tax rate.

5.6.3 Ross Region

Real Property Tax Impact: Tax impacts for increased berry production in the Ross Region were estimated to be negligible based on a series of assumptions.

Personal Income Tax Impact: Costs were estimated to be negligible based on a series of assumptions. Income taxes to the schools were estimated to be $458 at the 0.5% income tax rate and $916 at the 1.0% income tax rate.

5.7 Estimated Fiscal Impact of Increased Berry Processing

5.7.1 Highland Region

Real Property Tax Impact: Tax impacts for increased berry processing in the Highland Region were estimated to be modest based on a series of assumptions.

Personal Income Tax Impact: Costs were estimated to be negligible based on a series of assumptions. Income taxes to the schools were estimated to be $1,957 at the 0.5% income tax rate and $3,914 at the 1.0% income tax rate.

5.7.2 Morgan Region

Real Property Tax Impact: Tax impacts for increased berry processing in the Morgan Region were estimated to be modest based on a series of assumptions.

Personal Income Tax Impact: Costs were estimated to be negligible based on a series of assumptions. Income taxes to the schools were estimated to be $2,364 at the 0.5% income tax rate and $4,728 at the 1.0% income tax rate.

5.7.3 Ross Region

Real Property Tax Impact: Tax impacts for increased berry processing in the Ross Region were estimated to be modest based on a series of assumptions.

Personal Income Tax Impact: Costs were estimated to be negligible based on a series of assumptions. Income taxes to the schools were estimated to be $1,801 at the 0.5% income tax rate and $3,603 at the 1.0% income tax rate.

5.8 Conclusions

Several conclusions were made by examining the Type SAM multipliers for each category and comparing them across the study communities. If a higher number of jobs are desired, extended berry production would yield increased employee compensation in the community with the highest employment multiplier. Among the three communities used in this study, the highest employment multiplier was found not only in Morgan Region but in Ross Region as well (see Table 5.1). An expansion to the fruit farming sector in the Ross Region and Morgan Region's economies would result in the greatest estimated impact to total employment.

Production Economic Multipliers by Region (Type SAM)			
Category	**Highland Region**	**Morgan Region**	**Ross Region**
Employment	1.12	1.16	1.16
Employee Compensation	1.35	1.96	1.23
Proprietor Income	1.38	1.17	1.33
Output/Sales	1.35	1.23	1.33

Table 5.1 Berry Production Economic Multipliers, All Regions (Type SAM)

If higher paying jobs are desired, extended berry production will be most successful in the community with the highest employee compensation multiplier. In the case of this study, Morgan Region had the highest employee compensation multiplier of 1.96 (see Table 5.1). An expansion in the fruit farming sector in the Morgan Region's economy would result in the greatest estimated impact to total employee compensation. If higher proprietor income is desired, one can see from the table that extended berry production will be most successful in Highland Region, which had a proprietor income multiplier of 1.38 (see Table 5.1). An expansion to the fruit farming sector in the Highland Region's economy would result in the greatest estimated impact to proprietor income. Furthermore, if higher output/sales are desired, extended berry production will be most successful in Highland Region, which had an output multiplier of 1.35 (see Table 5.1). An expansion to the fruit farming sector in the Highland Region's economy

would result in the greatest estimated impact to total output. Overall, an expansion to the fruit farming sector would be most successful in the Highland Region's economy because of its estimated impacts to total output and proprietor income. Additionally, an expansion to the fruit farming sector would be successful in the Morgan Region's economy because of its estimated impact to total employment and employee compensation.

Additionally, the same concepts were applied to the berry processing side. Multipliers for berry processing were higher than for berry production, meaning that an expansion to the fruit processing sector would result in greater estimated impacts to all categories. For employment, an expansion to the fruit processing sector in the Morgan Region would result in the greatest estimated impact to total employment, because it had the highest employment multiplier (see Table 5.2). The employee compensation multiplier was highest in Morgan Region, so an expansion to the fruit processing sector would result in the greatest estimated impact to total employee compensation in that region. Proprietor income saw the highest multiplier in Ross Region, and the highest output/sales multiplier was found in Morgan Region (see Table 5.2). Overall, an expansion to the fruit farming sector would be the most profitable in the Morgan Region's economy because of its greatest estimated impact to total employment, total employee compensation, and total output/sales.

Processing Economic Multipliers by Region (Type SAM)			
Category	**Highland Region**	**Morgan Region**	**Ross Region**
Employment	2.08	2.33	1.83
Employee Compensation	2.32	3.07	1.57
Proprietor Income	39.97	33.51	46.44
Output/Sales	1.34	1.38	1.30

Table 5.2 Berry Processing Economic Multipliers, All Regions (Type SAM)

In addition to policymakers and decision-makers in the three study regions, those involved in the top economic sectors most affected by increased berry production and/or processing would also benefit from the information presented in this report. An increase in berry production affects fruit farming, agriculture and forestry support services, owner-occupied dwellings, food services and drinking places, health offices, hospitals, real estate, monetary authorities, wood container and pallet manufacturing, other state and local government enterprises, accounting and bookkeeping services, petrochemical manufacturing, and truck transportation. An increase in berry processing would also affect these and other similar sectors of the total economy. Stakeholders in these sectors could see increased employment, employee compensation, proprietor income, and output/sales.

5.9 Recommendations

Based on the results of this study, the following recommendations are made. At the state level, multipliers indicated that an expansion in berry production would lead to the greatest estimated impact in employment in the Morgan and Ross Regions, the greatest estimated impact in employee compensation in the Morgan Region, the greatest estimated impact in proprietor income in the Highland Region, and the greatest estimated impact in output/sales in the Highland Region. Therefore, if policymakers and decision makers wish to increase total employment, an expansion of the berry production sector should be encouraged in the Morgan and Ross Regions. If an increase in employee compensation is desired, an expansion of the berry production sector should be encouraged in the Morgan Region. If higher proprietor income is sought, efforts to expand the berry production sector in the Highland Region should be pursued. Lastly, if an increase in output/sales is desired, efforts to expand the berry production sector in the Highland Region should be pursued.

Processing multipliers indicated that the greatest estimated impact in employment would be felt in the Morgan Region. The greatest estimated impact in employee compensation would be felt in the Morgan Region. The greatest estimated impact in proprietor income would be realized in the Ross Region, and the greatest estimated impact in output/sales would be accomplished in the Morgan Region. Therefore, if an increase in total employment is desired, an expansion of the berry processing sector in the Morgan Region should be pursued. If an increase in employee compensation is desired, an expansion of the berry processing sector in the Morgan Region

should be pursued. Likewise, if an increase in proprietor income is desired, an expansion of the berry processing sector in the Ross Region should be pursued, and if an increase in total output/sales is desired, an expansion of the berry production sector in the Morgan Region should be pursued. Based on processing multipliers, it appears that the greatest estimated impacts to all sectors would be realized in the Morgan Region, as it has the highest multipliers for nearly all categories.

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Appendix A
Study Regions

Appendix B

Net Income Impact Total Economy - Production			
Region	**Existing**	**Est'd w/ 10% Increase**	**Est'd w/ 20% Increase**
Highland	$425,761,000	$17,216	$34,432
Morgan	$300,381,000	$27,019	$54,037
Ross	$408,318,000	$16,293	$42,587

Table B.1 Proprietors' Income Effect for the Total Economy (Production)

Net Income Impact Total Economy- Processing		
Region	**Existing**	**Est'd w/ 6 FTE Increase**
Highland	$425,761,000	$11,000
Morgan	$300,381,000	$1,000
Ross	$408,318,000	$21,000

Table B.2 Proprietors' Income Effect for the Total Economy (Processing)

Appendix C

C. Estimated Economic Impacts of Increased Berry Production by Region

C.1 Highland Region

C.1.2 Production Employment

Existing employment in the Highland Region in 2006 was 132,075 FTE's (Table C1). If existing levels of berry production in Highland Region were to increase by 10%, an estimated 9.22 Full-Time Equivalents (FTE's) would be added to the overall economy. If existing levels of berry production in the Highland Region were to increase by 20%, an estimated 18.44 Full-Time Equivalents (FTE's) would be added to the overall economy.

Employment Effects (Total Economy) in total number of jobs			
Region	**Existing**	**Est'd w/ 10% Increase**	**Est'd w/ 20% Increase**
Highland	132,075	9.22	18.44
Morgan	115,118	7.76	15.51
Ross	120,617	5.70	11.40

Table C.1 Employment Effects for the Total Economy (Production)

Type SAM multipliers were used in this analysis. The mean estimated multiplier for employment in the Highland Region among all sectors was 1.72. The estimated employment

multiplier for fruit production was 1.12. The estimated multiplier was below the mean employment multiplier for the region (Table C2).

Highland Region Multipliers (Type SAM)			
Category	**Fruit Production**	**Fruit Processing**	**Mean**
Employment	1.12	2.08	1.72
Employee Compensation	1.35	2.32	1.59
Proprietor Income	1.38	39.97	9.81
Output/Sales	1.35	1.34	1.35

Table C.2 Highland Region Economic Multipliers (Type SAM)

C.1.3 Production Employee Compensation

Total employee compensation in the Highland Region in 2006 was $4.5 billion. If berry production were to increase by 10%, an estimated $67,254 in employee compensation would be added to the entire economy (Table C3). This represented an estimated impact of less than one percent. If berry production were to increase by 20%, an estimated $134,508 in employee compensation would be added to the total economy (Table C3). This was a percentage increase of less than one percent.

Compensation Effects (Total Economy)			
Region	**Existing**	**Est'd w/ 10% Increase**	**Est'd w/ 20% Increase**
Highland	$4,548,289,000	$67,254	$134,508
Morgan	$3,693,432,000	$39,121	$78,241
Ross	$4,088,822,000	$73,549	$147,097

Table C.3 Employee Compensation Effects for the Total Economy (Production)

Type SAM multipliers were used in this analysis. The mean estimated multiplier for employee compensation among all sectors in the Highland Region was 1.59. The estimated employee compensation multiplier for fruit production was 1.35. The estimated multiplier was above the mean employee compensation multiplier for the region (Table C2).

C.1.4 Production Proprietor Income

Total proprietor income in the Highland Region was $425.7 million in 2006. A 10% increase in production in this region added an estimated $17,216 to the entire economy, which represented a less than one percent impact to the total economy. A 20% increase in production added an estimated $34,432 to the economy, which was also less than one percent. Type SAM multipliers were used in this analysis. The mean estimated multiplier for proprietor income among all sectors in the Highland Region was 9.81. The estimated proprietor income multiplier for fruit production was 1.38. The estimated multiplier was below the mean proprietor income multiplier for the region (Table C2).

C.1.5 Production Output

Output, or sales, in the Highland Region was $16.4 billion in 2006. If berry production were to increase by 10%, an estimated $234,856 in additional new production output would be added to the total economy, which was less than one percent. A 20% increase in production would result in an estimated additional $469,711 to the total economy. This was also less than a one percent increase (Table C4).

Output Effects (Total Economy)			
Region	**Existing**	**Est'd w/ 10% Increase**	**Est'd w/ 20% Increase**
Highland	$16,444,047,000	$234,856	$469,711
Morgan	$12,831,965,000	$398,241	$796,481
Ross	$16,282,087,000	$228,446	$456,893

Table C.4 Output Effects for the Total Economy (Production)

Type SAM multipliers were used in this analysis. The mean estimated multiplier for output among all sectors in the Highland Region was 1.35. The estimated output multiplier for fruit production was 1.35. The estimated multiplier was equal to the mean output multiplier for the region (Table C1).

C.1.6 Production Most Affected Economic Sectors (Sum of employment, employee compensation, output, and proprietor income)

The 10 economic sectors most affected by increased berry production in the Highland Region were fruit farming, agriculture and forestry support services, owner-occupied dwellings,

truck transportation, food services and drinking places, health offices, hospitals, real estate, monetary authorities, and other state government enterprises (Table C5). Sectors are ranked by the total dollar effect to the economy, from largest to smallest.

Production Most Affected Economic Sectors – Highland Region	
Sector	**Total Dollar Effect**
Fruit farming	$711,251
Agriculture and forestry support services	$55,694
Owner-occupied dwellings	$21,101
Truck transportation	$13,290
Food services and drinking places	$9,901
Offices of physicians-dentists-and other health	$8,354
Hospitals	$6,966
Real estate	$6,360
Monetary authorities and depository credit services	$5,061
Other state and local government enterprises	$4,699

Table C.5 Ten Economic Sectors Most Affected by Increased Berry Production in the Highland Region

C.1.7 Net Income Associated With Increased Levels of Berry Production

Net income associated with increased levels of berry production was determined by estimating changes to proprietor income levels as a result of a 10% and 20% increase in berry production. In 2006, total proprietor income in the Highland Region was $425.7 million. As a result of a 10% increase in berry production, total additional proprietor income for the entire

regional economy was estimated at $17,216. After the 20% increase in berry production, total additional proprietor income for the entire regional economy was estimated at $34,432.

C.2 Morgan Region

C.2.1 Production Employment

Existing employment in the Morgan Region in 2006 was 115,118 FTE's (Table C2). If existing levels of berry production in Morgan Region were to increase by 10%, an estimated 7.76 Full-Time Equivalents (FTE's) would be added to the overall economy. If existing levels of berry production in the Morgan Region were to increase by 20%, an estimated 15.51 Full-Time Equivalents (FTE's) would be added to the overall economy. Type SAM multipliers were used in this analysis. The mean estimated multiplier for employment among all sectors in the Morgan Region was 1.83. The estimated employment multiplier for fruit production was 1.16. The estimated multiplier was below the mean employment multiplier for the region (Table C6).

Morgan Region Multipliers (Type SAM)			
Category	**Fruit Production**	**Fruit Processing**	**Mean**
Employment	1.16	2.33	1.83
Employee Compensation	1.96	3.07	2.77
Proprietor Income	1.17	33.51	35.82
Output/Sales	1.23	1.38	1.42

Table C.6 Morgan Region Economic Multipliers (Type SAM)

C.2.2 Production Employee Compensation

Total employee compensation in the Morgan Region was $3.6 billion in 2006. If berry production were to increase by 10%, an estimated $39,121 in employee compensation would be added to the entire economy (Table C3). This represented an estimated impact of less than one percent. If berry production were to increase by 20%, an estimated $78,241 in employee compensation would be added to the total economy (Table C3). This was a percentage increase of less than one percent. Type SAM multipliers were used in this analysis. The mean estimated multiplier for employee compensation among all sectors in the Morgan Region was 2.77. The estimated employee compensation multiplier for fruit production was 1.96. The estimated multiplier was below the mean employee compensation multiplier for the region (Table C6).

C.2.3 Production Proprietor Income

Proprietor income in the Morgan Region totaled $300.3 million in 2006. If berry production were to increase by 10%, an estimated $27,019 in additional proprietor income would be added to the total economy. This represented an impact of less than one percent. If berry production were to increase by 20%, an estimated $54,037 in proprietor income would be added to the total economy. Type SAM multipliers were used in this analysis. The mean estimated multiplier for proprietor income among all sectors in the Morgan Region was 35.82. The estimated employment multiplier for fruit production was 1.17. The estimated multiplier was below the mean proprietor income multiplier for the region (Table C6).

C.2.4 Production Output

Output, or sales, in the Morgan Region was $12.8 billion in 2006. If berry production were to increase by 10%, an estimated $398,241 in additional new production output would be added to the total economy, which was less than one percent. A 20% increase in production would result in an estimated additional $796,481 to the total economy. This was also less than a one percent increase (Table C4). Type SAM multipliers were used in this analysis. The mean estimated multiplier for output among all sectors in the Morgan Region was 1.42. The estimated output multiplier for fruit production was 1.23. The estimated multiplier was below the mean output multiplier for the region (Table C6).

C.2.5 Production Most Affected Economic Sectors (Sum of employment, employee compensation, output, and proprietor income)

The ten economic sectors most affected by increased berry production in the Morgan Region were fruit farming, accounting and bookkeeping services, petrochemical manufacturing, owner-occupied dwellings, real estate, health offices, wood container and pallet manufacturing, truck transportation, hospitals, and other state government enterprises (Table C7). Sectors are ranked by the total dollar effect to the economy, from largest to smallest.

Production Most Affected Economic Sectors – Morgan Region	
Sector	**Total Dollar Effect**
Fruit farming	$1,106,053
Accounting and bookkeeping services	$43,798
Petrochemical manufacturing	$16,916
Owner-occupied dwellings	$16,551
Real estate	$12,385
Offices of physicians-dentists-and other health	$12,299
Wood container and pallet manufacturing	$10,451
Truck transportation	$10,054
Hospitals	$9,410
Other state and local government enterprises	$8,506

Table C.7 Ten Economic Sectors Most Affected by Increased Berry Production in the Morgan Region

C.2.6 Net Income Associated With Increased Levels of Berry Production

Net income associated with increased levels of berry production was determined by estimating changes to proprietor income levels as a result of a 10% and 20% increase in berry production. In 2006, total proprietor income in the Morgan Region was $300.4 million. As a result of a 10% increase in berry production, total additional proprietor income for the entire regional economy was estimated at $27,019. After the 20% increase in berry production, total additional proprietor income for the entire regional economy was estimated at $54,037.

C.3 Ross Region

C.3.1 Production Employment

Existing employment in the Ross Region was 120,617 FTE's in 2006. If existing levels of berry production in the Ross Region were to increase by 10%, an estimated 5.70 Full-Time Equivalents (FTE's) would be added to the overall economy. If existing levels of berry production in the Ross Region were to increase by 20%, an estimated 11.40 Full-Time Equivalents (FTE's) would be added to the overall economy. Type SAM multipliers were used in this analysis. The mean estimated multiplier for employment among all sectors in the Ross Region was 1.69. The estimated employment multiplier for fruit production was 1.16. The estimated multiplier was below the mean employment multiplier for the region (Table C8).

Ross Region Multipliers (Type SAM)			
Category	**Fruit Production**	**Fruit Processing**	**Mean**
Employment	1.16	1.83	1.69
Employee Compensation	1.23	1.57	2.60
Proprietor Income	1.33	46.44	13.53
Output/Sales	1.33	1.30	1.34

Table C.8 Ross Region Economic Multipliers (Type SAM)

C.3.2 Production Employee Compensation

Total employee compensation in the Ross Region was $4.08 billion in 2006. If berry production were to increase by 10%, an estimated $73,549 in employee compensation would be added to the entire economy (Table C3). This represented an estimated impact of less than one

percent. If berry production were to increase by 20%, an estimated $147,097 in employee compensation would be added to the total economy (Table C3). This was a percentage increase of less than one percent. Type SAM multipliers were used in this analysis. The mean estimated multiplier for employee compensation among all sectors in the Ross Region was 2.60, which indicates increasing employee compensation in the region. The estimated employee compensation multiplier for fruit production was 1.23. The estimated multiplier was below the mean employee compensation multiplier for the region (Table C8).

C.3.4 Production Proprietor Income

Proprietor income in the Ross Region totaled $408.3 million in 2006. If berry production were to increase by 10%, an estimated $16,293 in additional proprietor income would be added to the total economy. This represented an impact of less than one percent. If berry production were to increase by 20%, an estimated $42,587 in proprietor income would be added to the total economy. Type SAM multipliers were used in this analysis. The mean estimated multiplier for proprietor income among all sectors in the Ross Region was 13.53. The estimated proprietor income multiplier for fruit production was 1.33. The estimated multiplier was below the mean proprietor income multiplier for the region (Table C8).

C.3.5 Production Output

Output, or sales, in the Ross Region was $16.2 billion in 2006. If berry production were to increase by 10%, an estimated $228,446 in additional new production output would be added to the total economy, which was less than one percent. A 20% increase in production would

result in an estimated additional $456,893 to the total economy. This was also less than a one percent increase (Table C4). Type SAM multipliers were used in this analysis. The mean estimated multiplier for output among all sectors in the Ross Region was 1.34. The estimated output multiplier for fruit production was 1.33. The estimated multiplier was below the mean output multiplier for the region (Table C8).

C.3.6 Production Most Affected Economic Sectors (Sum of employment, employee compensation, output, and proprietor income)

The ten economic sectors most affected by increased berry production in the Ross Region were fruit farming, agriculture and forestry support services, owner-occupied dwellings, food services and drinking places, health offices, hospitals, real estate, monetary authorities, wood container and pallet manufacturing, and other state government enterprises (Table C9). Sectors are ranked by the total dollar effect to the economy, from largest to smallest.

Production Most Affected Economic Sectors – Ross Region	
Sector	**Total Dollar Effect**
Fruit farming	$731,803
Agriculture and forestry support activities	$27,166
Owner-occupied dwellings	$22,286
Food services and drinking places	$10,568
Offices of physicians-dentists-and other health	$8,749
Hospitals	$8,170
Real estate	$7,654
Monetary authorities and depository credit services	$6,929
Wood container and pallet manufacturing	$5,942
Other state and local government enterprises	$5,541

Table C.9 Ten Economic Sectors Most Affected by Increased Berry Production in the Ross Region

C.3.7 Net Income Associated With Increased Levels of Berry Production

Net income associated with increased levels of berry production was determined by examining the proprietor income levels after the 10% and 20% increases. In 2006, total proprietor income in the Ross Region was $408.3 million. After the 10% increase in berry production employment, total additional proprietor income was estimated at $16,293. After the 20% increase in berry production employment, total additional proprietor income was estimated at $42,587.

Appendix D

D. Estimated Economic Impacts of Increased Levels of Berry Processing By Region

D.1 Highland Region

D.1.1 Processing Employment

According to the IMPLAN database, there were no sales in the fruit processing sector in the Highland Region in 2006. Therefore, Highland Region processing effects throughout this study were calculated using the average of the Morgan Region and Ross Region processing effects. Existing total employment in the Highland Region was 312,075 FTE's in 2006 (Table D1). Estimated impact to total employment as a result of a 6 FTE increase in processing employment was 13 FTE's to the total economy, which represented a less than one percent increase (Table D1).

Employment Effects (Total Economy) in total number of jobs		
Region	**Existing**	**Est'd w/ 6 FTE Increase**
Highland	132,075	13
Morgan	115,118	14
Ross	120,617	11

Table D.1 Employment Effects for the Total Economy (Processing)

Type SAM multipliers were used in this analysis. The mean estimated multiplier for employment among all sectors in the Highland Region was 1.72. The estimated employment multiplier for fruit processing was 2.08. The estimated multiplier was above the mean employment multiplier for the region (see Table C2).

D.1.2 Processing Employee Compensation

Highland Region employee compensation totaled $4.5 billion in 2006. An increase in processing employment of 6 FTE's would result in an estimated total additional $320,738 of employee compensation, which represented a less than one percent increase. Employee compensation in the fruit processing sector was $45.3 million in 2006 (Table D2). Existing levels of employee compensation are shown (Table D2), along with the amounts that would be added to the entire economy following a 6 FTE increase in berry processing.

Compensation Effects (Total Economy)		
Region	**Existing**	**Est'd w/ 6 FTE Increase**
Highland	$4,548,289,000	$320,738
Morgan	$3,693,432,000	$304,284
Ross	$4,088,822,000	$337,192

Table D.2 Employee Compensation Effects for the Total Economy (Processing)

Type SAM multipliers were used in this analysis. The mean estimated multiplier for employee compensation among all sectors in the Highland Region was 1.59. The estimated employee compensation multiplier for fruit was 2.32. The estimated multiplier was above the mean employee compensation multiplier for the region (Table C2).

D.1.3 Processing Proprietor Income

Total proprietor income in Highland Region was $425.7 million in 2006. If berry processing were to increase by 6 FTE's, an estimated $11,000 in additional proprietor income would be added to the entire economy, which represented a less than one percent increase. Type SAM multipliers were used in this analysis. The mean estimated multiplier for proprietor income among all sectors in the Highland Region was 9.81. The estimated proprietor income multiplier for fruit processing was 39.97. The estimated multiplier was above the mean proprietor income multiplier for the region (Table C2).

D.1.4 Processing Output

Output, or sales, in Highland Region totaled $16.4 billion in 2006. A 6 FTE increase in fruit processing added an estimated $2,637,218 to the total economy, which was less than a one percent increase. Fruit processing output was $358.3 million in 2006 (see Table D3).

Output Effects (Total Economy)		
Region	**Existing**	**Est'd w/ 6 FTE Increase**
Highland	$16,444,047,000	$2,637,218
Morgan	$12,831,965,000	$3,077,115
Ross	$16,282,087,000	$2,197,320

Table D.3 Output Effects for the Total Economy (Processing)

Type SAM multipliers were used in this analysis. The mean estimated multiplier for output among all sectors in the Highland Region was 1.35, which indicates output losses in the region. The estimated output multiplier for fruit processing was 1.34. The estimated multiplier was above the mean output multiplier for the region (Table C2).

D.1.5 Processing Most Affected Economic Sectors (Sum of employment, employee compensation, output, and proprietor income)

The 10 economic sectors most affected by increased berry production in the Highland Region were fruit and vegetable canning and drying, frozen food manufacturing, truck transportation, wholesale trade, management of companies and enterprises, owner-occupied dwellings, monetary authorities, fruit farming, warehousing and storage, and health offices (Table D4). Sectors are ranked by the total dollar effect to the economy, from largest to smallest.

Processing Most Affected Economic Sectors – Highland Region	
Sector	**Total Dollar Effect**
Fruit and vegetable canning and drying	$2,333,103
Frozen food manufacturing	$1,914,266
Truck transportation	$291,490
Wholesale trade	$71,631
Management of companies and enterprises	$58,100
Owner-occupied dwellings	$57,582
Monetary authorities and depository credit services	$53,919
Fruit farming	$35,503
Warehousing and storage	$16,718
Offices of physicians-dentists-and other health	$11,678

Table D.4 Ten Economic Sectors Most Affected by Increased Berry Processing in the Highland Region

D.1.6 Net Income Associated With Increased Levels of Berry Processing

Net income associated with increased levels of berry processing was determined by examining the proprietor income levels after the hypothetical small processor was added to the region. In 2006, total proprietor income in the Highland Region was $425.7 million. After the 6.00 FTE increase in berry processing, total estimated additional proprietor added to the whole economy was estimated at $11,000.

D.2 Morgan Region

D.2.1 Processing Employment

Existing employment in the Morgan Region was 115,118 FTE's in 2006. A hypothetical small processor was added to the region with an estimated 6.00 FTE increase in fruit processing employment. This added an estimated total of 14.00 FTE's to the economy as a whole, which

was a less than one percent increase (Table D1). Existing levels of employment are shown (Table D1), along with the amounts that would be added to the entire economy following a 6 FTE increase in berry processing. Type SAM multipliers were used in this analysis. The mean estimated multiplier for employment among all sectors in the Morgan Region was 1.83. The estimated employment multiplier for fruit processing was 2.33. The estimated multiplier was above the mean employment multiplier for the region (Table C6).

D.2.2 Processing Employee Compensation

Total employee compensation in the Morgan Region was $3.6 billion in 2006. A 6 FTE increase in fruit processing added an estimated $304,284, which was a less than one percent increase (Table D2). Existing levels of employee compensation are shown (Table 13), along with the amounts that would be added to the entire economy following a 6 FTE increase in berry processing employment. Type SAM multipliers were used in this analysis. The mean estimated multiplier for employee compensation among all sectors in the Morgan Region was 2.77. The estimated employee compensation multiplier for fruit processing was 3.07. The estimated multiplier was above the mean employee compensation multiplier for the region (Table C6).

D.2.3 Processing Proprietor Income

Proprietor income in the Morgan Region totaled $300.3 million in 2006. A 6 FTE increase in fruit processing added an estimated additional $1,000 to the total economy, which was a less than one percent increase. Type SAM multipliers were used in this analysis. The mean estimated multiplier for proprietor income among all sectors in the Morgan Region was 35.82.

The estimated proprietor income multiplier for fruit processing was 33.51. The estimated multiplier was below the mean proprietor income multiplier for the region (Table C6).

D.2.4 Processing Output

Output, or sales, in the Morgan Region was $12.8 billion in 2006. A 6 FTE increase in fruit processing added an estimated $3,077,115 to the total economy, which was a less than one percent increase (Table D3). Existing levels of output are shown (Table D3), along with the amounts that would be added to the entire economy following a 6 FTE increase in berry processing employment. Type SAM multipliers were used in this analysis. The mean estimated multiplier for output among all sectors in the Morgan Region was 1.42. The estimated output multiplier for fruit processing was 1.38. The estimated multiplier was below the mean output multiplier for the region (Table C6).

D.2.5 Processing Most Affected Economic Sectors (Sum of employment, employee compensation, output, and proprietor income)

The 10 economic sectors most affected by increased berry processing in the Morgan Region were fruit and vegetable canning and drying, truck transportation, glass container manufacturing, wholesale trade, fruit farming, plastics, monetary authorities, power generation and supply, management of companies and enterprises, and owner-occupied dwellings (Table D5). Sectors are ranked by the total dollar effect to the economy, from largest to smallest.

Processing Most Affected Economic Sectors – Morgan Region	
Sector	**Total Dollar Effect**
Fruit and vegetable canning and drying	$2,333,103
Truck transportation	$201,390
Glass container manufacturing	$61,871
Wholesale trade	$45,370
Fruit farming	$35,503
Plastics plumbing fixtures and all other plastics	$33,134
Monetary authorities and depository credit services	$31,176
Power generation and supply	$30,548
Management of companies and enterprises	$29,713
Owner-occupied dwellings	$28,052

Table D.5 Ten Economic Sectors Most Affected by Increased Berry Processing in the Morgan Region

D.2.6 Net Income Associated With Increased Levels of Berry Processing

Net income associated with increased levels of berry processing was determined by examining the proprietor income levels after the hypothetical small processor was added to the region. In 2006, total proprietor income in the Morgan Region was $300.3 million. After the 6.00 FTE increase in berry processing employment, total additional estimated proprietor income for the whole economy was $1,000.

D.3 Ross Region

D.3.1 Processing Employment

Existing employment in the Ross Region was 120,617 FTE's in 2006. A hypothetical small processor was added to the region, which led to an estimated increase of 6.00 FTE's. This added an estimated additional 11.00 FTE's to the total economy, which was a 183.33% increase (Table D1). Existing levels of employment are shown (Table D1), along with the amounts that

would be added to the entire economy following a 6 FTE increase in berry processing employment. Type SAM multipliers were used in this analysis. The mean estimated multiplier for employment among all sectors in the Ross Region was 1.69. The estimated employment multiplier for fruit processing was 1.83. The estimated multiplier was above the mean employment multiplier for the region (Table C8).

D.3.2 Processing Employee Compensation

Total employee compensation in the Ross Region was $4.08 billion in 2006. A 6 FTE increase in fruit processing added an estimated additional $337,192 to the total economy, which was a less than one percent increase (Table 4.13). Existing levels of employee compensation are shown (Table D2), along with the amounts that would be added to the entire economy following a 6 FTE increase in berry production employment. Type SAM multipliers were used in this analysis. The mean estimated multiplier for employee compensation among all sectors in the Ross Region was 2.60, which indicates increasing employee compensation in the region. The estimated employee compensation multiplier for fruit processing was 1.57. The estimated multiplier was below the mean employee compensation multiplier for the region (Table C8).

D.3.3 Processing Proprietor Income

Proprietor income in the Ross Region totaled $408.3 million in 2006. A 6 FTE increase in fruit processing added an estimated $21,000 to the total economy, which was a less than one percent increase. Type SAM multipliers were used in this analysis. The mean estimated multiplier for proprietor income among all sectors in the Ross Region was 13.53. The estimated

proprietor income multiplier for fruit processing was 46.44. The estimated multiplier was far above the mean proprietor income multiplier for the region (Table C8).

D.3.4 Processing Output

Output, or sales, in the Ross Region was $16.2 billion in 2006. A 6 FTE increase in fruit processing added an estimated additional $2,197,320 to the total economy, which was less than one percent (Table D3). Existing levels of output are shown (Table D3), along with the amounts that would be added to the entire economy following a 6 FTE increase in berry processing. Type SAM multipliers were used in this analysis. The mean estimated multiplier for output among all sectors in the Ross Region was 1.34. The estimated output multiplier for fruit processing was 1.30. The estimated multiplier was below the mean output multiplier for the region (Table C8).

D.3.5 Processing Most Affected Economic Sectors (Sum of employment, employee compensation, output, and proprietor income)

The ten economic sectors most affected by increased berry processing in the Ross Region were truck transportation, owner-occupied dwellings, management of companies and enterprises, wholesale trade, meat processed from carcasses, monetary authorities, food services and drinking places, animal slaughtering, plastics, and warehousing and storage (Table D6). Sectors are ranked by the total dollar effect to the economy, from largest to smallest.

Processing Most Affected Economic Sectors – Ross Region	
Sector	**Total Dollar Effect**
Truck transportation	$90,100
Owner-occupied dwellings	$29,530
Management of companies and enterprises	$28,387
Wholesale trade	$26,738
Meat processed from carcasses	$25,930
Monetary authorities and depository credit services	$23,192
Food services and drinking places	$20,857
Animal-except poultry-slaughtering	$19,729
Plastics plumbing fixtures and all other plastics	$16,535
Warehousing and storage	$7,435

Table D.6 Ten Economic Sectors Most Affected by Increased Berry Processing in the Ross Region

D.3.6 Net Income Associated With Increased Levels of Berry Processing

Net income associated with increased levels of berry processing was determined by examining the proprietor income levels after the hypothetical small processor was added to the region. In 2006, total proprietor income in the Ross Region was $408.3 million. After the 6.00 FTE increase in berry processing, total additional estimated proprietor income for the whole economy was $21,000.