The Economic Impact of Fruit and Vegetable Production in Southwest Iowa Considering Local and Nearby Metropolitan Markets

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Summary of Findings

This study evaluates regional economic impact gains that might accrue if the region were to increase its fresh fruit and vegetable production to accommodate local or regional demand. The study region is composed of 10 counties: Adair, Adams, Audubon, Cass, Guthrie, Harrison, Mills, Montgomery, Pottawattamie, and Shelby. This area includes some of Iowa's most rural areas, yet it also is strongly influenced by the metropolitan reach of Omaha and Council Bluffs to the west and Des Moines on the east, which also serve as potential markets.

There were two production scenarios evaluated in this research. The first has farmers in the 10-county region producing enough of 22 fruits and vegetables to meet the amount of local consumption that would be expected to occur during a typical Iowa growing season. That estimation process concludes that satisfying local fresh fruit and vegetable demands for that growing season would result in

- 902 acres of new fruit and vegetable production. The farm-gate value of that production would be $2.42 million in sales, and the potential retail value of that produce would be $5.2 million.

- Considering all linkages to the regional economy, that level of fruit and vegetable productivity (just considering farm level boosts) would yield a total of $928,373 in labor incomes and nearly 16 more jobs for the region.

The second scenario assumes the region produces for the metropolitan markets on its east and west borders. In doing so, and considering the production incentive reductions that distance creates, satisfying a portion of the fresh fruit and vegetable demand of those markets with the amounts that can be grown during Iowa's typical growing season would result in:

- An additional 2,107 acres of fruit and vegetable production in the region that would yield $4.62 million in direct farm level sales, and fetch $11.41 million when sold at the retail level.

- Considering all linkages to the regional economy, that level of fruit and vegetable productivity (just considering farm level boosts) would yield a total of $1.75 million in labor incomes and nearly 29 more jobs for the region.

When both scenarios are combined, farm level production increases could generate, within the 10-county area, $2.67 million in labor incomes and the equivalent of 45 jobs.

Introduction

This research project investigated the regional potential of increased fruit and vegetable production in southwest Iowa. The study region is composed of 10 counties: Adair, Adams, Audubon, Cass, Guthrie, Harrison, Mills, Montgomery, Pottawattamie, and Shelby. This area includes some of Iowa's most rural areas, yet it also is strongly influenced by the metropolitan reach of Omaha and Council Bluffs to the west and Des Moines on the east.

Iowa only produces a small fraction of its annual consumption of fresh fruits and vegetables and must import these agricultural commodities from other areas to meet our needs. One way in which rural economies can grow is to replace imports with local production, or through import substitution. The other much more common manner in which rural economies can increase local incomes is by increasing the volume or the kinds of commodities that they export. Anything that is sold beyond the region's boundaries constitutes an export sale for the producing area, whether it goes to other parts of the state, or to meet the heightened demand shown in the eastern and western bordering metropolitan areas. This research investigated the potential value of import substitution and export sales of fruit and vegetable production in southwest Iowa.

This research was supported in its entirety by the Leopold Center for Sustainable Agriculture at Iowa State University.

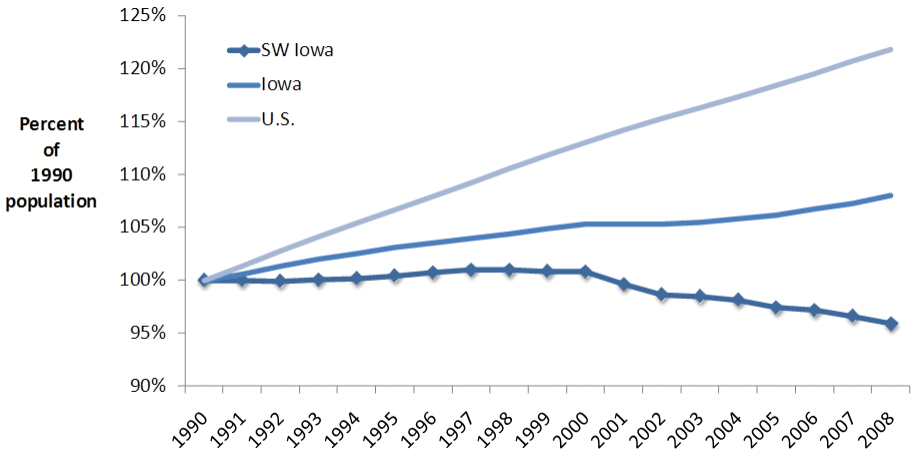
Socio-Economic Baseline

It is important to understand the region's overall demographic changes and the economic activity patterns that have evolved over the years. This region is characterized by population declines in its non-metropolitan portions, slow job growth, and comparatively low earnings per job. The region is highly dependent on agriculture – far more than the Iowa average – and its regional retail sales levels indicate there are substantial trade leakages out of the region.

Population

The region's economic characteristics include the metropolitan influence of Council Bluffs. In this initial assessment, several of the indicators are compiled with Pottawattamie County excluded from the analysis to avoid diluting or exaggerating the findings for the remaining nine counties of the region. **Figure 1** shows the performance of the region without Pottawattamie County when compared to Iowa and the United States. Between 1990 and 2008, the U.S. population grew by 22 percent, Iowa's rose by 8 percent, but the region declined by 3.4 percent.

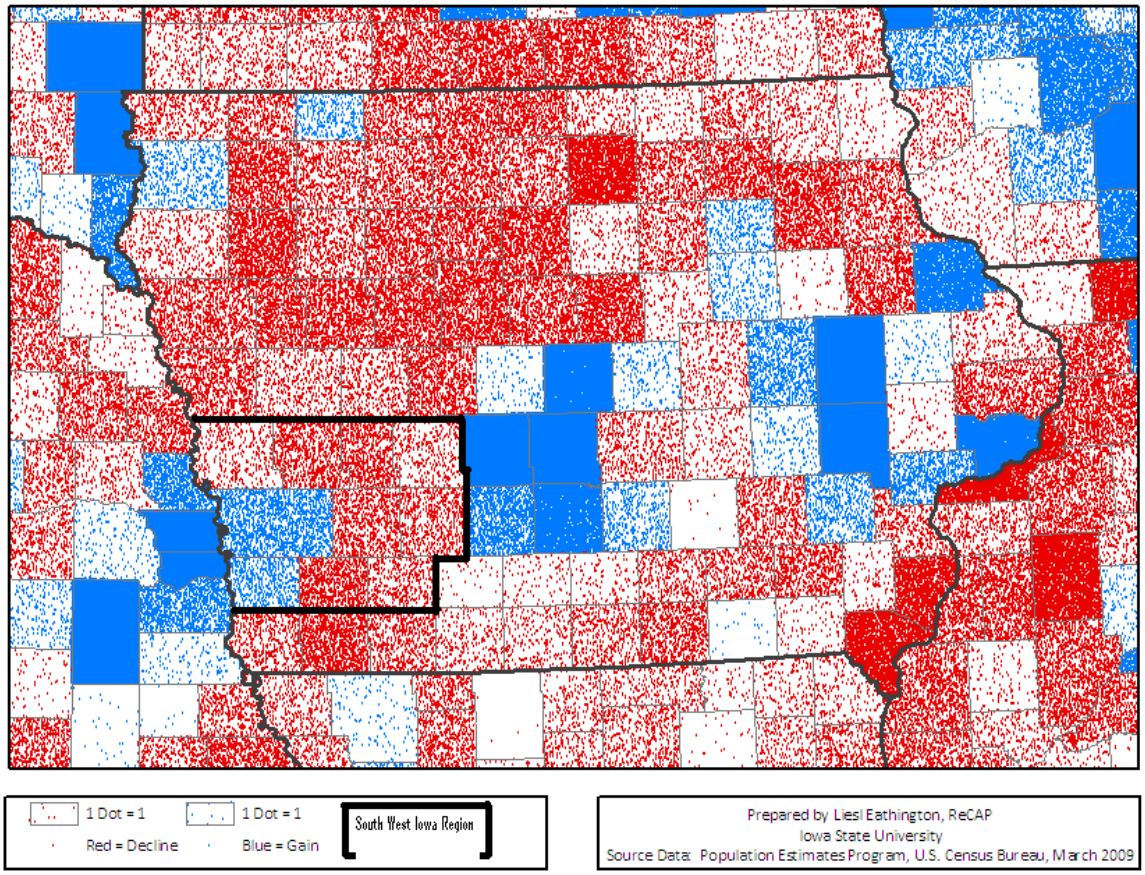
Figure 1: Regional Population Trends (1990 = 100%)



Source: U.S. Census

Population erosion in this area is not a unique occurrence. Most of Iowa and its bordering counties have seen population declines. **Figure 2** (next page) illustrates the changes in rural fortunes during this decade in Iowa and on its borders. The red values show declines, and the blue values show increases. Each dot represents a person. Only Pottawattamie and Mills counties in the southwest region showed gains this decade, but the entire region abuts major metropolitan areas that posted very strong population gains.

Figure 2: Cumulative Population Change (2000–2008)



Source: Liesl Eathington, ReCAP, Iowa State University

Table 1 shows the region's population distribution (without Pottawattamie County). Nearly 39 percent live in unincorporated areas, a figure much higher than the Iowa average. If we include the 24.2 percent of the region living in towns of 500 to 2,499 persons and the 10.3 percent living in places with fewer than 500 persons, 73 percent of the region could be considered as rural residents according to the standard census definitions of urban residence.

Table 1: Distribution of the Regional Population by City Size in 2007

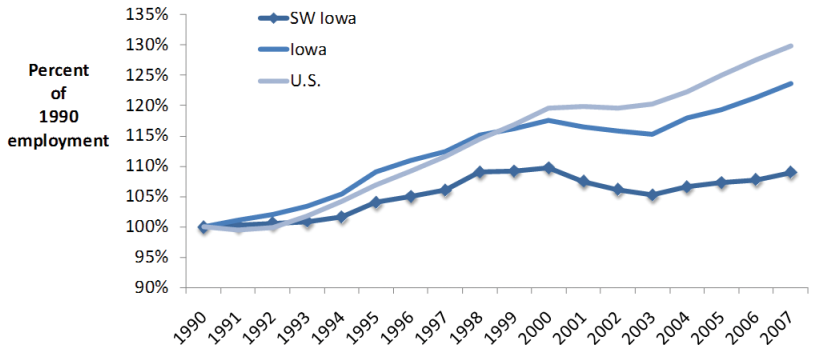
City Size	*SW Iowa*	*Percent of Total*
Total population living in cities	59,419	61.5 %
Cities with fewer than 500 residents	9,950	10.3 %
500 to 2,499 residents	23,424	24.2 %
2,500 to 9,999 residents	26,045	27.0 %
10,000 to 24,999 residents	0	0.0 %
50,000 or more residents	0	0.0 %
Population in unincorporated areas	37,214	38.5 %
Total population in 2007	**96,633**	**100.0 %**

Source: U.S. Census

The Economy

Figure 3 demonstrates regional job changes over the past quarter-century. Since 1990, the number of U.S. jobs grew by 30 percent, Iowa increased by 23.6 percent, and the region by 9 percent. Notably, even though the region is posting job gains, those gains are still not sufficient to stem the population decline.

Figure 3: Regional Job Trends (1990 = 100%)



Source: Bureau of Economic Analysis

The region supported 43,862 private sector jobs in 2007. Following the other services category with nearly 23 percent of private sector jobs, farm or farm-related jobs amounted to 19.3 percent of the total, and trade jobs claimed 17.1 percent

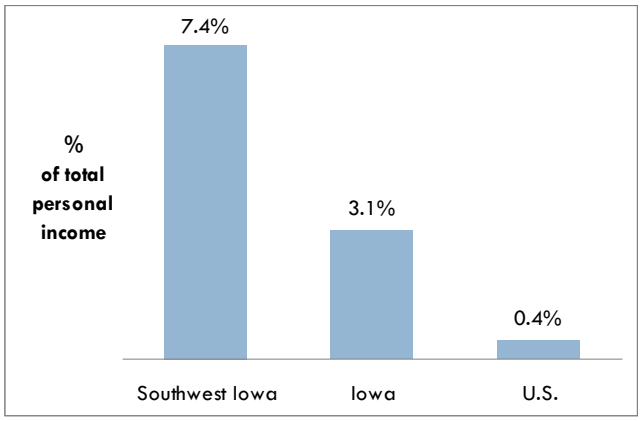
Table 2

Jobs by Sector	*Jobs*	
	number	*percent*
All Private Businesses	43,862	100.0
Agriculture, Forestry, Fishing, Hunting, and Mining	8,466	19.3
Construction	2,880	6.6
Manufacturing	3,329	7.6
Wholesale and Retail Trade	7,498	17.1
Transportation, Information, Warehousing, and Utilities	3,243	7.4
Finance, Insurance, and Real Estate (F.I.R.E.)	2,306	5.3
Professional, Scientific, and Technical Services	1,151	2.6
Education, Health Care, and Social Assistance	4,982	11.4
Other Services	10,007	22.8

Source: County Business Patterns

The region's dependence on farm employment is evident in **Figure 4**. As a percentage of all income from all sources, the southwest Iowa region is almost 2.4 times more reliant on farm earnings than the state average, and nearly 19 times more dependent than the national average. From 2005 to 2007, the region's residents received an average of 7.4 percent of their personal incomes from farming.

Figure 4: Farm Earnings



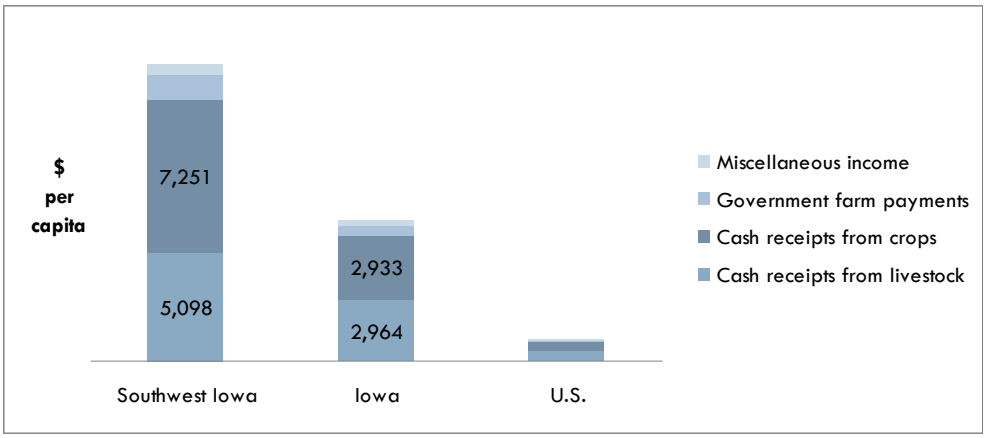
Farm earnings include the net income of farm proprietors, plus the value of wages and salaries paid to farm laborers.

This chart shows the percentage of the region's total personal income that was accounted for by farm earnings during the years from 2005–2007.

Source: Bureau of Economic Analysis

The value of that dependence is clearly displayed in **Figure 5**. Here we see that the region's total farm receipts per capita were $14,069 in 2007, compared to the state's average level $6,655. The region's strong ties to agricultural marketing per capita are evident in both livestock and crops: animal sales receipts were $5,100 per capita and crop receipts were $7,250.

Figure 5: Gross Farm Income



The major sources of gross farm income include cash receipts from the sale of livestock and crops, government farm payments, and miscellaneous sources that include machine hire, custom work, and an imputed value for livestock and crops that are produced and consumed on the farm.

Government farm payments in southwest Iowa averaged $1,237 per capita, per year during 2006–2007.
Miscellaneous farm income in southwest Iowa averaged $453 per capita during that period.
In southwest Iowa, total receipts from farming averaged $14,039 per person per year from 2005–2007.
The region's average farm receipts were higher than Iowa's statewide average of $6,655 per capita.

Source: Bureau of Economic Analysis

Table 3 summarizes overall industrial productivity for the region. Pottawattamie County's effect is displayed separately to demonstrate the overwhelming influence it has on the larger region. The primary region had 52,481 jobs in 2007, but including the Pottawattamie County economy boosts that total to 103,088. The main way an area's economy is measured is by calculating value added (which is the same as gross domestic product). Value added is composed of all incomes from wages and salaries, the returns that sole proprietors make, the returns on investments, and indirect tax payments. The region produced $2.55 billion in value added, but with Pottawattamie County's value added in the mix, the total climbs to $5.72 billion. The last number is total industrial output or the sum of all value added and all purchased commodities and services. The region's total output (which is somewhat analogous to gross sales) was $5.66 billion, and with the Council Bluffs area that amount rises to $12.31 billion.

Table 3: Composition of Regional Industrial Output, 2007

	Southwest Iowa	***Including Pottawattamie County***
Total employment in number of jobs	52,481	103,088
Labor income in $ billions	1.50	3.40
Other value added in $ billions	1.05	2.31
Total value added (gross regional product) in $ billions	2.55	5.72
Value of purchased commodities and services in $ billions	3.11	6.59
Total industrial output (sales) in $ billions	5.66	12.31

Source: Input-output model of SW Iowa, Department of Economics, ISU

As mentioned previously, the value added figure is the most appropriate way to gauge regional economic value. **Table 4** (next page) gives us a sense of regional (without Pottawattamie County) value added production by major industry. It also compares the region to the state and to the nation. All agriculture accounted for 19.7 percent of the production total for the region, compared to 6.6 percent for the state. The region is much less dependent on manufacturing than the state norm, and much less dependent on finance, insurance, and real estate employment. It is, however, more dependent on local and state government spending and institutional support as components of the regional economy. Public administration (all government activity) accounted for 16.3 percent of value added compared to the state average of 11.5 percent.

Table 4: Composition of Gross Regional Product

	Southwest Iowa	*State of Iowa*	*United States*
Percentage of Gross Regional Product (Total Value Added)	**100.0**	**100.0**	**100.0**
Agriculture, Forestry, Fishing, Hunting, and Mining	19.7	6.6	3.1
Construction	4.9	4.9	5.0
Manufacturing	12.3	19.0	11.4
Wholesale and Retail Trade	12.1	12.6	12.0
Transportation, Information, Warehousing, and Utilities	8.0	9.5	10.1
Finance, Insurance, and Real Estate (FIRE)	5.0	10.9	14.8
Professional, Scientific, and Technical Services	2.1	3.5	7.3
Education, Health Care, and Social Assistance	5.3	7.4	7.7
Other Services	14.4	14.0	16.3
Public Administration	16.3	11.5	12.2

Source: Input-output model of SW Iowa, Department of Economics, ISU

Table 5 provides a concise summary of the region's overall economic situation. While per capita incomes are quite close to the state average, average earnings of the nonfarm proprietor were 25 percent less than the state average of $20,038, and wage and salary compensation per worker was 19.2 percent lower. Retail sales per capita, however, are very low in the region. The $5,733 per capita value posted as a regional average was 48 percent lower than the Iowa average of $11,091. The region's overall retail trade performance is very weak and suffers from significant trade leakage, the vast majority of which accrues to the metropolitan areas on its borders.

Table 5: Summary of Income and Trade Performance

Income and Earnings	***SW Iowa***	***Iowa***	***U.S.***
Personal income per capita, 2007	$33,364	$34,916	$38,615
Average earnings per nonfarm proprietor, 2007	$14,998	$20,038	$29,740
Average compensation per wage & salary worker, 2007	$34,905	$43,191	$53,892
Retail Sales			
Average taxable retail sales per capita, 2008	$5,733	$11,091	

Sources: Bureau of Economic Analysis; RECAP, ISU

Fresh Fruit and Vegetable Production

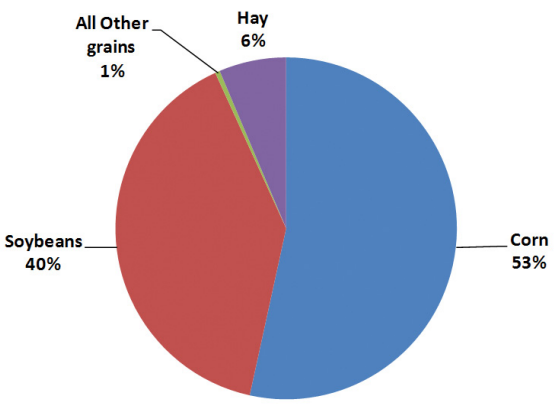
There is a substantial increase in local food production in both Iowa and the United States. This movement is motivated by the strong desire to re-introduce local fresh fruits and vegetables into regions that had either long ago ceded those commodities to other regions that demonstrated comparative advantages or into areas where those commodities had not been produced because of climate or other environmental limitations, but could be options in different production configurations. Economically, this movement is viewed as a mechanism for generating higher levels of income per acre of production when compared to conventional agricultural activity, such as corn and soybean production. The popularity of local food production has spurred policies and programs designed to research regional production potentials, consumption, and the eventual economic impacts that might result if production relationships were changed to allow regions to became more self-sufficient in the production and consumption of these important agricultural products.

There also is an impetus to provide profitable production models for smaller scale farmers in the state. Iowa has lost about 9,800 farm proprietors since 2001, nearly 100 per county. Profitable opportunities for small farm operations are limited, and most small farmers in Iowa derive the majority of their incomes from nonfarm sources.

Maintaining rural residences is increasingly difficult for many. In the past 10 years, 70 of Iowa's 99 counties and about 70 percent of its communities posted population declines. Farm and rural nonfarm economic prospects are stagnant at best, and eroding rapidly at worst. One of the proposed mechanisms for stabilizing rural areas is the reintroduction of profitable smaller-scale agricultural production. Over the past quarter century, most attempts to stabilize rural areas were unsuccessful or, if episodically successful, were not substantial enough to overcome the structural changes in rural production that continue to lead to widespread rural outmigration. Part of the problem is the increasingly specialized nature of conventional farming in the state and across the Plains and Midwest states. Large operations grow just two primary crops in Iowa, and the price of land reflects the overall profitability of large-scale, heavily mechanized production with low average costs. This incremental production evolution has eliminated much of the state's agricultural diversity.

Figure 6 demonstrates the state's current production concentration: 93 percent of harvested acres in 2008 were either in corn or soybeans, and a mere 1 percent went to all other grains or uses after accounting for hay production.

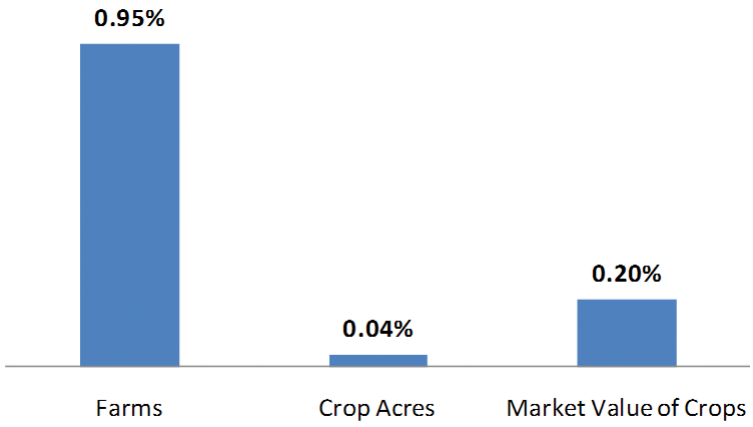
Figure 6: Iowa Principal Crop Harvested Acres in 2008



Source: 2007 Agricultural Census

Looking at the 2007 Agricultural Census for Iowa (see **Figure 7**), we know that less than 1 percent of the state's farms produced, as just one example, vegetables and melons. The land upon which they produced those crops accounted for just 4/100th of 1 percent of the state's cropland. The $20.4 million in total sales from those crops constituted a mere one-fifth of 1 percent of the state's crop marketings.

Figure 7: Function of Iowa Farms and Crop Acres Producing Vegetables and Melons in 2007



Source: 2007 Agricultural Census

Historical production patterns notwithstanding, there is still growing demand in the United States and in Iowa for locally grown fresh fruits and vegetables. This study considers the economic impact potential of local foods production, and the dimensions of value added activity that may serve to boost local economies – both on a small, community scale as well as a regional level.

The next section focuses on discovering the import-substitution and export values of locally or regionally produced fruits and vegetables products. Import substitution also is known by the phase: "buy local." Whatever the tagline, when people consume commodities that are locally produced versus those that are imported from other regions, they create a true economic impact by reducing sales leakages and bolstering local economic activity. The local economy expands as a result, provided the local purchase is competitive in price and quality with the substituted commodity. As was demonstrated in Table 5, this region suffers severe trade leakage. Similarly, if a region is able to boost exports, especially to nearby consumers, there also is an economic impact when money from outside of the region is flowing into the region.

Understanding the Statewide Potential of Fruit and Vegetable Production

The overall capacity of all counties in Iowa to produce vegetables, fruits, and melons was determined before conducting this analysis. Working through the state level numbers is instructive in explaining the scenario values that were developed for this region.

In **Table 6** we see that the top 15 of 37 total crops accounted for 97.3 percent of all fruits and vegetable produced on an acre basis, while the top 15 crops on a per farm basis accounted for 82 percent of all production on farms that were producing these commodities. The weighted

acreage averages are important, too. An average of 3.2 acres per farm was dedicated to producing all fruits, vegetables, and melons. For this list of 15 items, the value ranged from a high of about 8.7 acres in sweet corn farms, to only one-half acre for tomatoes.

Total sales of fruits and vegetables in Iowa were $20.4 million according to the 2007 Census of Agriculture, so Iowa farmers averaged $6,866 in sales per farm and $2,137 per acre cultivated in 2007. Though we do not know net income from these sales, it is safe to assume that as practiced in Iowa, fruit and vegetable production at the farm level represents a relatively small portion of household incomes.

Table 6: Top 15 Fruit, Vegetable, and Melon Production by Acres and by Farm Numbers in Iowa, 2007

Top 15 in Total Acres	*Acres*	*Cumulative % of Total*	*Top 15 in Total Farms*	*Farms*	*Cumulative % of Total*
Sweet corn	3,548	37.2%	Sweet corn	410	13.8%
Peas, green	1,342	51.2%	Tomatoes in the open	346	25.4%
Beans, snap	837	60.0%	Pumpkins	282	34.9%
Pumpkins	830	68.7%	Potatoes	230	42.7%
Watermelons	823	77.3%	Beans, snap	203	49.5%
Potatoes	646	84.1%	Peppers, Bell	194	56.0%
Vegetables, other	231	86.5%	Squash, all	138	60.7%
Cantaloupes	217	88.8%	Peppers, other than Bell	137	65.3%
Squash, all	175	90.6%	Vegetables, other	113	69.1%
Tomatoes in the open	168	92.4%	Watermelons	88	72.1%
Cabbage, head	141	93.9%	Cucumbers and pickles	87	75.0%
Carrots	128	95.2%	Asparagus, bearing age	85	77.9%
Peppers, Bell	118	96.4%	Cantaloupes	78	80.5%
Onions, dry	79	97.3%	Onions, dry	53	82.3%
Total	**9,545**		**Total**	**2,971**	

Source: 2007 Agricultural Census

The Iowa Produce Market Potential Calculator is an on-line utility created by the Leopold Center for Sustainable Agriculture and ISU's Center for Transportation Research and Education.[1] It helps producers and local food advocates understand the market potential of different fruits and vegetables while considering existing production, farm values, and the potential retail values of 37 items that could be grown in Iowa. Using the Iowa Produce Market Calculator, 22 of the 37 items listed in that utility were chosen to estimate the number of acres

1 Found at www.ctre.iastate.edu/produce

statewide that would be required to satisfy Iowa fresh fruits and vegetable needs. The calculator helps us determine how many acres of land would be needed to produce those commodities considering Iowa's overall production characteristics, climate, and the state's estimated per capita consumption.[2]

The 22 items were chosen because they constituted more than 99 percent of what was already being produced in Iowa, and a standard approach to economic analysis is to begin with existing revealed production preferences. These specific items are displayed in **Table 7**, and the acreage amounts are shown in **Figure 8**.

Table 7: Primary Fruits and Vegetables

Beans (Snap)	Asparagus
Cabbage	Cucumbers
Eggplant	Broccoli
Peppers (Bell)	Watermelons
Potatoes (Fresh)	Cantaloupes
Tomatoes	Apples
Squash	Cherries
Sweet Corn	Grapes
Pumpkin	Peaches
Carrots	Pears
Onions	Plums

Given Iowa yields, it would take 30,253 acres to produce these 22 primary fruits and vegetables that Iowans consume annually. But, Iowa cannot grow crops all year long, so we must factor in seasonality and production capacities. Iowa's growing season is much shorter than what is the norm in the rest of the U.S., so the amount of realistic fresh food demand the state is able to produce must reflect this limit.

Table 8 displays the production assumptions given the state's growing season. The seasonal demand in this exercise assumes the region can produce a quarter of the fresh fruit and vegetable demand for their citizens, given their growing season. Carrots, potatoes, and pumpkins were increased to 50 percent of our likely consumption that could be produced annually locally due to either extended storage capacity or that we tended to consume more of the items while in season. Similarly, onions and potatoes store very well, and the fraction that could be produced was bumped to 75 percent. Lastly, sweet corn production was bumped to 75 percent as well because we primarily consume this item in season.

These estimates are arbitrary in part, as they are not based on actual commodity production flows, but they provide a reasonable starting point for the analysis. In addition, they introduce realistic limits to Iowa production that cannot be discounted.

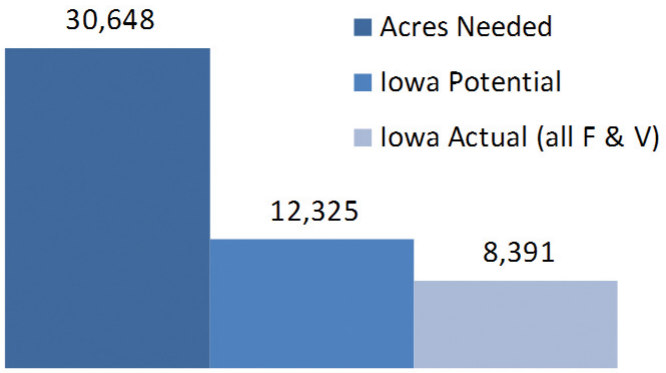
2 These are the 37 fruits and vegetables that constitute the unabridged version of Table 6: Apples, Apricots, Asparagus, Beans (Snap), Blackberries, Blueberries, Broccoli, Cabbage, Cantaloupes, Carrots, Cauliflower, Cherries, Cucumbers, Eggplant, Garlic, Grapes, Greens/Collards, Lettuce (Head), Lettuce (Leaf), Nectarines, Okra, Onions, Peaches, Pears, Peppers (Bell), Plums, Potatoes (Fresh), Potatoes (Sweet), Pumpkins, Radishes, Raspberries, Spinach, Squash, Strawberries, Sweet Corn, Tomatoes, and Watermelons.

Table 8: Primary Production Assumptions: Percent of Fresh Demand Potentially Satisfied by Local Producers

Asparagus	25%	Peaches	25%
Beans (Snap)	25%	Pears	25%
Broccoli	25%	Peppers (Bell)	25%
Cabbage	25%	Plums	25%
Cantaloupes	25%	Potatoes (Fresh)	75%
Carrots	50%	Potential Apples	50%
Cherries	25%	Pumpkin	50%
Cucumbers	25%	Squash	25%
Egg Plant	25%	Sweet Corn	75%
Grapes	25%	Tomatoes	25%
Onions	75%	Watermelons	25%

This estimation process reduces the potential acres for producing fresh fruits and vegetables for our own consumption to 12,325 acres using existing Iowa production characteristics and the demand and supply factors contained in the Iowa Produce Market Calculator. Existing production of those major fruits and vegetables in Iowa required 8,391 acres in 2007, but that acreage is heavily dominated by sweet corn. Indeed, sweet corn, peas, snap beans, pumpkins, watermelons, and potatoes made up 84 percent of all production in 2007, so it can be concluded that were the state to expand production of major fruits and vegetables on a seasonal basis, a substantial fraction of the 12,325 required acres would be needed (see **Figure 8**).

Figure 8: Acres to Produce 22 Fruits and Vegetables in Iowa

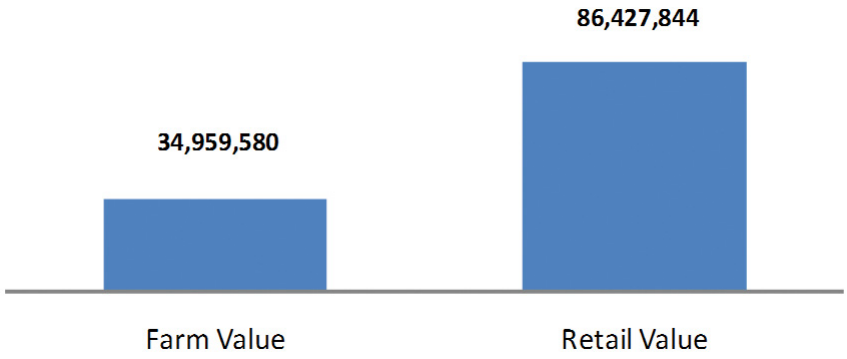


It is important to note at the outset that the potential growth in acres needed to produce all Iowans' seasonal consumption of these products is comparatively meager. To put it into perspective, consider these facts:

- The average county in Iowa contains 240,300 acres of harvested cropland.
- The 12,325 new acres that would be required to produce all of these 22 fruits and vegetables for *the entire state*, considering Iowa's growing season, would constitute 5.1 percent of the cropland in *just one county*.[3]
- Accordingly, the distribution of fruits and vegetable production across the entire state on a land basis only producing for all Iowans requires just 123 acres per county – slightly less than one-fifth of a square mile.

Nonetheless, the total statewide sales potential to bolster farm income is robust, considering 2008 average prices. If these farmers are able to directly market their produce, as many farmers do, the retail value of that production is impressive. **Figure 9** informs us that the farm gate value of that production would be almost $35 million, about $2,836 per acre of production. The retail value is worth as much as $86.43 million, although one would assume the addition of transport, warehousing, storage, and store costs in a retailing configuration.

Figure 9: Statewide Farm and Market Values of Seasonal Fruit and Vegetable Production



Understanding the Regional Potential of Fruit and Vegetable Production for Regional Consumption

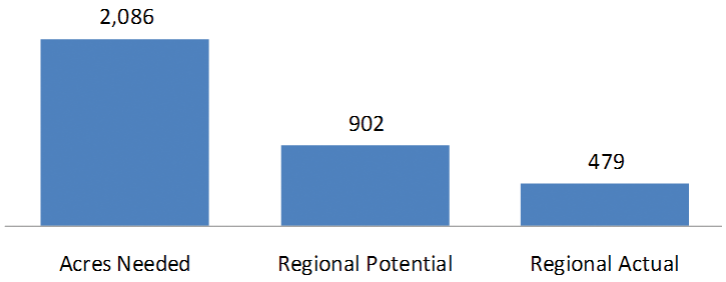
The first step in assessing the region's production opportunities is to gauge overall regional demand relative to regional supply. Again, the Iowa Produce Market Potential Calculator was used to assess the area's production potential after considering existing production, the regional population, and the 22 fruits and vegetables considered for this analysis. In the remaining analysis, Pottawattamie County has been reinstated to the assessment as its population is now considered part of the local demand, and that population also would use produce imports as substitutes.

3 In an assessment where all 37 fruits and vegetables were produced, 2006 research by this author found that such production would require about 15,300 acres for Iowa. The current Iowa Produce Market Calculator has factored in higher average yield values per acre than the earlier model, thereby slightly reducing the overall acres needed. Additionally, these estimates are made for the top 22 fruits and vegetables which, according to the USDA Agricultural Census, constituted 99.7 percent of all fruit and vegetable production acres in 2007, not the entire list of 37 items.

Figure 10 gives the same types of acreage estimates for southwest Iowa that were produced previously for the state of Iowa. Given the region's total demand for the 22 fresh fruits and vegetables assessed in this analysis, it would need 2,086 acres to produce a year's supply. However the region cannot produce year-round, so the region needs 902 acres to satisfy its demand based on its ability to produce during the typical Iowa growing season. In 2007, the agricultural census indicated there were 479 acres of land producing fruits, vegetables, and melons in the region.

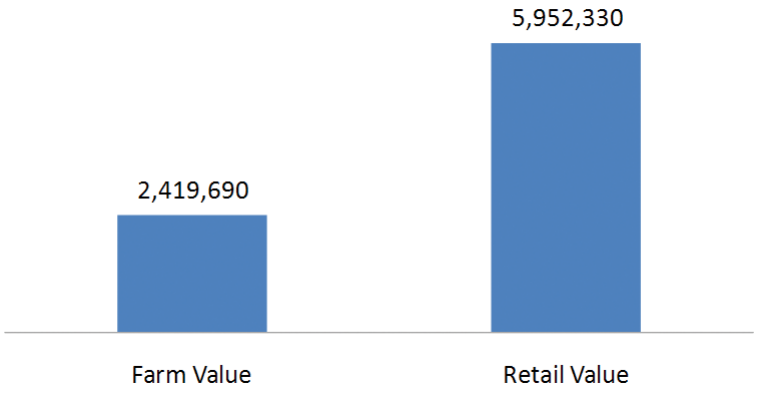
To reiterate, the seasonal demand in this exercise assumes the region can produce a quarter of the fresh fruit and vegetable demand for their citizens, given their growing season. The assumptions listed in Table 8 are used to reduce the acres from 2,086 to 902.

Figure 10: Acres to Produce 22 Fruits and Vegables in Southwest Iowa



The market value of those selected crops is displayed in **Figure 11**. Farmers could realize $2.4 million in farm level sales, and the retail value of that produce would be $5.95 million.

Figure 11: Southwest Iowa Farm and Market Values of Seasonal Fruit and Vegetable Production



The potentials both at the farm and retail levels for producing and consuming locally are impressive. It must be remembered that a large portion of that potential is concentrated in Pottawattamie County where a substantial fraction of the region's overall demand is located in the metropolitan core city of Council Bluffs.

There are, however, significant regional export sales potentials possible within the Omaha and the Des Moines metropolitan areas. The next section investigates the production potential for considering those large populations as well.

Understanding the Regional Potential of Fruit and Vegetable Production for Sale to Neighboring Metropolitan Areas

In assessing the sales potential for southwest Iowa when considering the neighboring metropolitan areas, it is important to begin to evaluate the effects of distance on sales potential. **Table 9** gives the average distances from the counties to the metro areas.[4] The shortest to the Omaha metropolitan area is Pottawattamie County at 25 miles, and the greatest is Guthrie County. Conversely, Guthrie County at 53 miles is the shortest distance to Des Moines, while Mills County tops the list at 146 miles.

Table 9: Distance to Metropolitan Areas

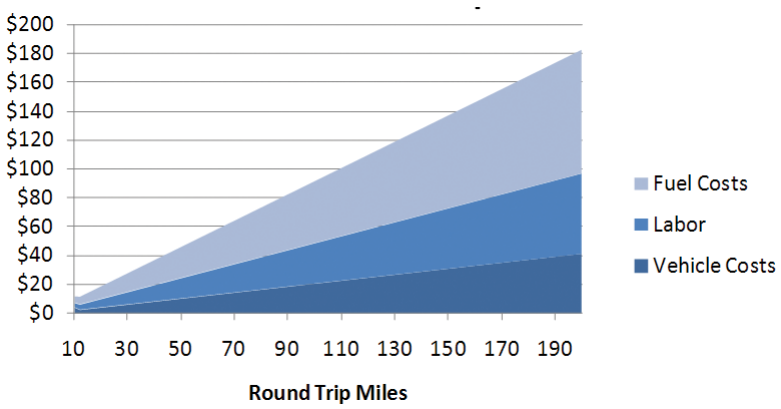
	Miles to Omaha Metro	*Miles to Des Moines Metro*
Adair	82	60
Adams	78	102
Audubon	80	88
Cass	65	82
Guthrie	97	53
Harrison	34	125
Mills	25	146
Montgomery	53	129
Pottawattamie	25	93
Shelby	55	103

Fruits and vegetables are heavy, perishable freight, so we must assume that distance and time matter, and producers will focus primarily on serving nearer markets rather than more distant sales venues. **Figure 12** illustrates the effects of distance on transport costs. These values represent the total costs of operation for a used single-axle farm truck in Iowa.[5] A 100-mile round trip would cost $91 considering vehicle, fuel, and labor costs and a 200-mile round trip would cost $182. Clearly, distance is an important consideration when calculating the potential returns to producers.

4 The Omaha metropolitan area includes Douglas and Sarpy County as both abut the region. The population of that area is 652,499. The Des Moines metro area is comprised of Polk, Dallas, and Warren counties with a population of 529,767 in 2008.

5 This calculation was made for average operation costs for a 2003 Chevrolet C7500 truck with 100,000 miles and an expected additional life of 100,000 miles. Fuel costs were $3 per gallon, and labor costs were calculated at $12.50 per hour.

Figure 12: Cost Per Trip



One of the mechanisms for estimating the pervasive and costly issue of transportation distance is to use a distance-decay function when estimating potential. Such a calculation involves dividing some critical value by distance for each county to compile sets of initial allocating factors for a known value. For this research, the average of two factors was used to allocate potential fruit and vegetable production acres among the counties studied.

- The first factor was to calculate the sum of farms in each region that had the following attributes:
    - farms with fewer than 50 acres,
    - farms that grew vegetables,
    - orchard farms,
    - organic farms and farms being converted to organic,
    - goat farms with sales,
    - sheep and lamb farms with sales,
    - poultry farms,
    - meat chicken farms, and
    - layer chicken farms.

    These numerical totals were divided by distances to the respective metropolitan areas in each county to yield a value used to apportion potential production.
- The second was the total amount of cropland in 2007 divided by distance to the respective metro areas.

The first factor attaches greater weight to the propensity of an area to have small and diversified farms. The second simply measures the value of available cropland. The first produces higher export production acres because the farms of that type already tend to concentrate near population centers. The second produces fewer acres as the variance in available farm-

land is less than the variance in small farms. The average of the two was used to estimate the likelihood of a county having acres producing crops for either of the metropolitan areas. That likelihood then was used to determine the overall level of production that could be considered feasible for regional farmers.

The next step involved considering regional competition for production geared to the two metropolitan areas. For the Omaha metropolitan area, if we proceed as before where it is assumed that a quarter of that metro's needs can be generated from area fruit and vegetable farmers, it was determined that the southwest Iowa region had the potential to produce for 40 percent of that amount of regional, seasonally constrained demand (as has already been discussed in Table 8). The remaining potential would be allocated as 20 percent to producers in the host counties of Douglas and Sarpy, and 40 percent to the Nebraska counties on the north, west, and south of that metropolitan area.

The Des Moines allocation also considered a production potential of 40 percent of that metro's demand (again, given the production assumptions demonstrated in Table 8) but in allocating those proportions, the production potentials of Dallas County, a major horticultural producer, along with Madison County, and Warren County were added to the analysis. They are nearer the metro and have strong potentials of producing for Des Moines area demand. Again, the remaining potential production for the metropolitan population was allotted to Polk County and all other counties that border the east and the north portions of the metro. The intermediate step of considering the southwest Iowa region and the metro effectively lowers the likely acres the region would dedicate to that area as there is much more producer competition to serve the Des Moines area metropolitan market.

Table 10 provides the results of those estimates. Realizing that distance will play a major role in the allocation of acres, we see that the highest number of projected acres is in Pottawattamie County which is located closest to Omaha. Trailing at 307 acres is Harrison County. The fewest acres were projected for Adams County at 75, followed by 99 in Montgomery.

Table 10: Projected Acres to Supply Potential Demand from Two Metro Areas

	Likely Acres for Omaha Metro	*Likely Acres for Des Moines Metro*	*Total Acres*
Adair	74	73	147
Adams	48	26	75
Audubon	83	54	137
Cass	94	56	149
Guthrie	74	98	171
Harrison	257	50	307
Mills	199	25	223
Montgomery	75	23	99
Pottawattamie	500	97	597
Shelby	144	59	203
Total	**1,546**	**561**	**2,107**

Table 11 displays the projected production potential as estimated through this process. As has already been determined, the region needs 902 acres to produce fruits and vegetables for its resident population. While the acreage demand measured for the entire Omaha metro is 3,865 acres, the region is projected to supply 1,546 or 40 percent of those acres. For the Des Moines metro, owing to regional competition and distances, even though the population requires 3,138 acres of production, the region would be expected to supply 561 total acres. The possibility to supply Omaha yields nearly three times as many acres as those needed to supply Des Moines.

Table 11: Projected Acres for Regional and Metropolitan Fruit and Vegetable Production in Southwest Iowa

	Total Seasonal Acres Required	*Projected Acres by Southwest Iowa Counties*
SW Region (With Pottawattamie)	902	902
Omaha (Douglas and Sarpy)	3,865	1,546
Des Moines (Polk, Dallas, Warren)	3,138	561
Total	**7,906**	**3,009**

Estimating the Regional Economic Impacts

Regional Import Substitute Impacts

If local farmers produce for local consumption of fruits and vegetables that had been imported, they create an economic impact. That impact must come at the expense of existing farm crop productivity as we assume that the region's high-quality cropland already is in production. The 902 required acres will come from existing corn and soybean farming. **Table 12** shows us that producing the $2.420 million in farm value sales of these different products requires the loss of $334,763 in corn and soybean sales.

Table 12: Regional Direct Values for Modeling Economic Impacts from Import Substitution

Likely Fruit & Vegetable Farm Value	$2,419,690
Likely Fruit & Vegetable Retail Value	$5,952,330
Corn & Soybean Offset	$334,763

Economic impacts are estimated using an input-output model of the regional economy. The modeling system accounts for expected transactions among all industries within a region. When a type of industrial activity expands, so do its demands for inputs. When area suppliers increase their sales, they in turn demand more regionally supplied inputs, and so on. This is called a multiplier effect. If we introduce more fruit and vegetable production, we will introduce more demand for inputs. We must offset those gains by losses to existing agriculture as cropland amounts are considered fixed.

There are three levels of economic activity that are measured with input-output models. The first is the direct value, the production that occurs in the industry we are studying, fruit and vegetable production in this instance. Next are the indirect values. They represent the sum of all regionally-supplied inputs the direct industry requires. Last are induced values. These emerge in an economy when the workers in the direct industry, along with those supported in the supplying industries, take their paychecks and convert them to household spending. In doing so, they induce another round of commercial activity in a region.

When conducting impact studies we focus on just a few of the many values that are produced from the modeling process. The first is the total industrial output. This represents the value of production during our measurement period. The next is labor income. Labor income is composed of the wages and salaries that are paid to employees along with the returns to management and ownership that accumulate to sole proprietors (such as farmers). The last number is jobs. There are more jobs in the economy than there are employed persons because many people have more than one job.

Table 13 contains the economic impact summary for the import substitution scenario where the region produces enough to meet its own consumption levels of 22 fruits and vegetables. To produce $2.42 million in output would require the equivalent of 8.7 jobs (as expressed on an annualized basis) earning $697,836 in labor income. That production would buy $595,572 in regionally supplied inputs that would support 4.9 more jobs and $164,380 in labor income. When the direct and the indirect workers spent their paychecks, they would induce $428,227 in additional regional sales, requiring five more jobs making $128,332 in labor income. In all, $3.44 million in industrial output is supported in the region, $990,548 in labor incomes, and 18.6 jobs.

Table 13: Regional Economic Impacts – Import Substitution

Region

	Direct	*Indirect*	*Induced*	*Total*	*Multiplier*
Output	2,419,689	595,572	428,227	3,443,488	1.42
Labor Income	697,836	164,380	128,332	990,548	1.42
Jobs	8.7	4.9	5	18.6	2.14

Region Offset

	Direct	*Indirect*	*Induced*	*Total*	*Multiplier*
Output	273,486	66,884	27,044	367,414	1.34
Labor Income	36,688	17,383	8,105	62,175	1.69
Jobs	1.8	0.5	0.3	2.7	1.50

Region Net

	Direct	*Indirect*	*Induced*	*Total*
Output	2,146,203	528,688	401,183	3,076,074
Labor Income	661,148	146,997	120,227	928,373
Jobs	6.9	4.4	4.7	15.9

The table also lists multipliers. Multipliers are provided for fruit and vegetable production and the combined row crop activity that must be offset. A multiplier is the total value divided by the direct value. The output multiplier for regional production of 1.42 means every $1 of output in fruit and vegetable farming yields $.42 in additional output in the rest of the regional economy. The 1.42 labor income multiplier means each $1 in labor income in fruit and vegetable production supports $.42 in labor income in the rest of the economy. Finally, a job multiplier of 2.14 means every job in fruit and vegetable farming supports 1.14 jobs in the rest of the regional economy.

The jobs multiplier is very high and merits further discussion before moving on. It is in fact much lower on a practical basis than just stated, as there are many more persons involved in direct production than the direct job values in Table 13 indicate.

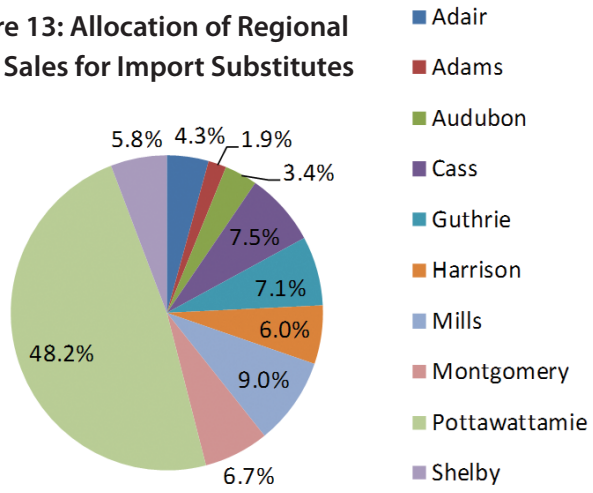
This type of production is labor intensive for a very short period of time. The modeling system annualizes the jobs in that it assumes something like continuous, year-long labor inputs and then determines the plausible job value of that effort. In practice, however, though many persons may be required to produce a fruit or vegetable crop, their labor is needed only for a very limited period. The farmer/owner actually may need dozens more persons to plant, tend, and harvest a crop than are indicated in Table 13, but the annualized value of jobs is counted as much less.

This is very confusing and bothersome to many reviewers as they may want to count, for example, each hired teenage worker as a job holder in documenting the employment value of production. The modeling system, however, is stingy, and it annualizes the job value given the national average worth of that type of job. The vast majority of fruit and vegetable production in the United States occurs in areas with very long growing seasons and multiple crops per parcel, so the average U.S. fruit and vegetable laborer puts in many more hours than an Iowa laborer. Compared to that standard, the plausible job value of Iowa's production potential is very low and that assessment is reflected in the job impact tables.

The research also must consider the economic impact of lost corn and soybean sales. After considering direct, indirect, and induced activity, that would reduce regional production by $367,414 in output, $62,175 in labor income, and 2.7 jobs.

After subtracting the offsets from the fruit and vegetable production impacts, the region nets $3.08 million in total output, $928,373 in regional labor income gains, and nearly 16 jobs created. It is better for reviewers and policy makers to focus on the potential labor income and job gains from shifting into this form of agricultural production versus overall multiplier values. Stated differently, the region, by shifting to fruits and vegetable production to satisfy local demand has the potential to increase local incomes by $928,175. Corresponding to each county's respective population size, those economic impacts would be expected to accumulate proportionately to the values in Figure 13. Nearly 48 percent of the impacts, 7.6 jobs and $445,620 in labor income, would find their way to Pottawattamie County, and the lowest impact would be attributed to the Adams County region.

Figure 13: Allocation of Regional Farm Sales for Import Substitutes



Export Expansion Due to Nearby Metro Sales

The next dimension of impacts considers the total economic impacts attributable to increased regional production needed to satisfy metropolitan demand from Omaha and Des Moines. The analysis considers the values and the offsets found in **Table 14**. Were the region to produce at the levels estimated previously, it would generate $4.62 million in farm-level sales, which would require additional acres and necessitate additional offsets of $638,878 from the corn and soybean sector.

Table 14: Regional Direct Values for Modeling Economic Impacts from Export Expansion to Metropolitan Areas

	Nebraska Metro Counties	*Mid-Iowa Metro*	*Total*
Likely Fruit and Vegetable Farm Value	3,388,517	1,229,337	4,617,854
Likely Fruit and Vegetable Retail Value	8,370,439	3,036,753	11,407,193
Corn and Soybean Offset	468,800	170,078	638,878

Table 15 provides the impacts for the metropolitan export sales. The farm-level activity will create a total of $6.57 million in industrial output, $1.89 million in labor income, and 35.5 jobs yielding $145,245 in income. When the difference is calculated, the region's output would grow by $5.71 million, which would support 29.2 jobs and $1.745 million in labor income.

Table 15: Potential Economic Impacts for Metropolitan Export Sales

Metro

	Direct	*Indirect*	*Induced*	*Total*	*Multiplier*
Output	4,617,854	1,136,619	817,249	6,571,722	1.42
Labor Income	1,331,783	313,711	244,916	1,890,410	1.42
Jobs	16.6	9.4	9.5	35.5	2.14

Metro Offset

	Direct	*Indirect*	*Induced*	*Total*	*Multiplier*
Output	638,878	156,244	63,176	858,298	1.34
Labor Income	85,704	40,608	18,933	145,245	1.69
Jobs	4.3	1.2	0.7	6.3	1.47

Metro Net

	Direct	*Indirect*	*Induced*	*Total*
Output	3.978,976	980,375	754,073	5,713,424
Labor Income	1,246,079	273,103	225,983	1,745,165
Jobs	12.3	8.2	8.8	29.2

Table 16 summarizes the combined potential for the region. If both the import substitution and the export expansion scenarios are realized fully for regional famers, total output in the region would grow by $8.79 million, labor incomes by $2.673 million, and 45 jobs would be supported.

Table 16: Total Region and Metropolitan Markets

	Direct	***Indirect***	***Induced***	***Total***	***Multiplier***
Output	6,125,179	1,509,063	1,155,256	8,789,498	1.43
Labor Income	1,907,227	420,100	346,210	2,673,538	1.40
Jobs	19.2	12.6	13.5	45.1	2.35

Discussion

In several previous studies the potential regional impacts were estimated given a scenario where half of the locally produced fruits and vegetables was sold to wholesalers and the other half was retailed directly by the producers. Those projected sales were estimated considering sets of centrally and strategically located fruit and vegetable stores that operated during the Iowa growing season. The feasibility of such configurations, however, has not been demonstrated in Iowa, so those types of gains remain speculative. In addition, gains to farmer-retailers would necessarily come at the expense of existing grocers, and valuing that offset can be problematic. The Iowa economy values its grocers, its wholesalers, and its existing fruit and vegetable distribution systems. Locally produced and retailed foods are not normatively more desirable than other food production and distribution scenarios, nor is there evidence pre-

sented in this report that local foods production and retail distribution is substantially more efficient than existing systems. This report simply measures the income producing potential were such a shift in production to eventuate. No estimates are made for farmer-retailers.

A regional farmer-retailer configuration may work in some areas. But, considering the immense retail and wholesale market power exhibited in both the Omaha and the Polk metropolitan economies as well as the overall sophistication of the nation's retail grocery sector, the development of farmer-to-consumer sales needs much more research before it can be declared there is a realistic potential for regional farmers to capture and ultimately profit from more direct sales relationship with regional consumers.

It is generally the case in a modern economy that producers, distributors, and retailers are highly specialized. Successful producers seek and obtain respective scale economies and comparative advantages because of their specialization. One would expect farmers to specialize in a few commodities, not the whole range of potential fruit and vegetable crops. Accordingly, the supposition that there is a natural farmer-to-retail configuration is perhaps a counter-intuitive and counter-economic argument, and becomes even more so when considering the broad spectrum of potential fruit and vegetable production possibilities.

That does not mean there are not opportunities for farmer cooperative systems that allow for a greater sharing of returns based on marketing, transport, and ultimately direct sales activities. Those returns remain unknown as there is no evidence of configurations of this sort, either prominent or imminent in the region we studied.

There have been produce cooperatives in Iowa over the decades, including apple cooperatives in western Iowa, but most have long since dissolved. This history leads us to question the profitability of such cooperative arrangements were they to develop in response to increased demand for local or regional produce.