Investigating the Potential Economic Impacts of Local Foods for Southeast Iowa

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Summary of Findings

This research study investigated the economic impacts of local foods production for the southeast Iowa region of Davis, Jefferson, Keokuk, Mahaska, Van Buren, and Wapello Counties. Local educators and community leaders in the region selected a set of eight fruits and vegetables and a set of meat products that could be locally produced. This analysis contrasts the regional income potential of eight locally produced items with an expanded list of 22 items that might be considered.

It is possible to gauge small area economic impacts under an import-substitution framework that replaces imported foodstuffs with locally grown foodstuffs. In this analysis, the locally grown foodstuffs are made available for their likely growing season, which in this case is limited primarily to three months. An addition to this analysis considers direct producer sales to consumers via regional marketing centers, as well as expanded small-scale meat production to accommodate locally produced meat product sales.

The major findings:

- For fruit and vegetable production, the eight-item scenario would add 5.3 jobs and $215,350 in labor income to the regional economy after considering reductions to soybean and corn farming from which the acres for this production were obtained. For the 22-item scenario, the impacts would be 11.6 jobs with $475,870 in total labor incomes.
- For direct sales of 50 percent of the locally produced fruits and vegetables, regional jobs would grow by 17.7 and labor incomes by 239,345. For the 22-item list, regional jobs would increase by 37.8 and incomes by $510,733.
- If the region were to attain self-sufficiency in chicken and egg production (not consumption), the region would realize a 19.8 total gain in jobs and $653,466 in labor income.
- Were the region to supply 25 percent of the chicken and eggs that regional consumers purchase for in-home consumption, the retail value would be $1.88 million.
- If the region were to add small meat slaughtering and processing capacities to accommodate an increase in locally produced lamb/goat and poultry consumption, each locker plant would add 5.1 jobs to the region, as well as $178,937 in labor incomes.
- In all, given the scenarios assessed in this study, local food production, retailing, and enhanced processing could create from 50 to 75 jobs divided between rural areas and communities.

The Region's Local Foods Scenarios

This region chose an initial set of eight fruits and vegetables to evaluate (tomatoes; peppers; greens such as kale, chard, and cabbage; squashes; beans; potatoes; eggplants; and apples). Along with those items the region chose chicken, egg, and lamb and meat goat production as potential items for boosting local production and sales.

In this analysis, the initial list of eight fruits and vegetables will be compared to a schedule of 22 fruits and vegetables. This gives the region an opportunity to compare the different outcomes from a more conservative initiative (the eight items) versus a more aggressive strategy (the 22 items).

We can determine the area's overall demand for and supply of fruits and vegetables by using the Iowa Produce Market Calculator, a web-based utility that is maintained by the Leopold Center for Sustainable Agriculture at Iowa State University.(http://www.leopold.iastate.edu/research/calculator/home.htm) Relying on a host of data and factors from the USDA, that tool allows analysts to gauge the prospective market for 37 fruits, melons, and vegetables at the county level.

The region's production or potential production of chicken, lamb, goat, and eggs requires an evaluation of data from the quinquennial agricultural census, the most recent of which has the 2007 data for the region. As the region is already self-reliant in animal meat production, mainly hogs and beef, there are limits to the import-substitution potential for these commodities, which are explored in the last section.

A Brief Look at Statewide Fruits, Vegetables, and Melon Potential

In preparing for this analysis, the overall capacity of all counties in Iowa to produce vegetables, fruits, and melons was determined. Working through the state-level numbers is instructive in explaining the scenario values that were developed for this region. In Table 4 we see that the top 15 crops (of 37 total) accounted for 97.3 percent of all produce on an acres basis, and the top 15 crops on a per farm basis accounted for 82 percent of all farms that were producing these commodities. The weighted averages also are important. The average number of acres per farm that were producing all fruits, vegetables, and melons was 3.2. That value (for this list of 15 items) ranged from a high of about 8.7 acres for the average sweet corn farm, to just half an acre for tomatoes. If total sales of fruits and vegetables were $20.4 million, then these 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 fruit and vegetable production as practiced at the farm level in Iowa represents a very small portion of household incomes.

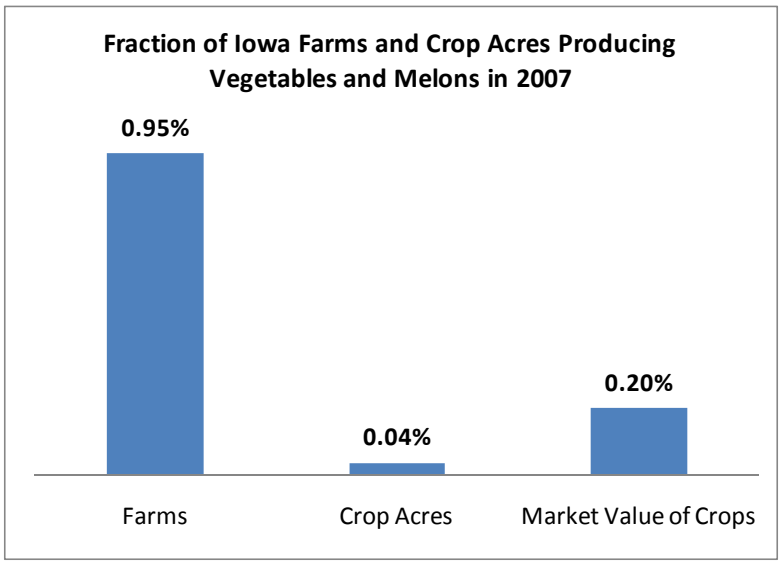

Figure 2

Historical production patterns notwithstanding, there has been growing enthusiasm in the United States and in Iowa for locally grown fresh fruits and vegetables and other farm products. The arguments for preferring locally grown farm products run the gamut from a belief that the crops are fresher and more nutritious, that they may have lower pesticide levels that they are more likely to be organically produced, to the idea that local consumption is, in and of itself, more environmentally friendly. All of these assertions are open to testing, but they are not the focus of this research. Instead, this study looks at the potential economic impact 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 scale.

This research centers on discovering the import-substitution value of locally or regionally produced fruits, vegetables, and meat products in a region of southeastern Iowa comprised of the counties of Davis, Jefferson, Keokuk, Mahaska, Van Buren, and Wapello. Import substitution also is known by the term: "buy local." Whichever term is used, 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.

This research relies on members of Hometown Harvest, a local food group in southeast Iowa and other participants from the study regions to define the commodities that they wish to model, the kinds of distribution systems that they envision, and levels of local consumption. This research also considers other locally grown products to include meat animals and eggs as part of the local effort. This research was funded in its entirety by the Leopold Center for Sustainable Agriculture at Iowa State University.

Understanding the Study Region

When evaluating a region's overall local foods production and demand potential, it is important to understand the region's situation, constraints, and prospects. The Davis, Jefferson, Keokuk, Mahaska, Van Buren, and Wapello County study region contains a mix of medium-sized and smaller counties. Both Oskaloosa and Wapello County are considered micropolitan statistical areas in that they have urban populations in excess of 10,000. Both of these communities serve as major regional trade centers.

This region posted an estimated population loss of 2,078 persons since 2000. The region had a natural gain (births minus deaths) of 1,629, but it also showed very high rates of outmigration. As of 2008, the region had more than 100,000 residents.

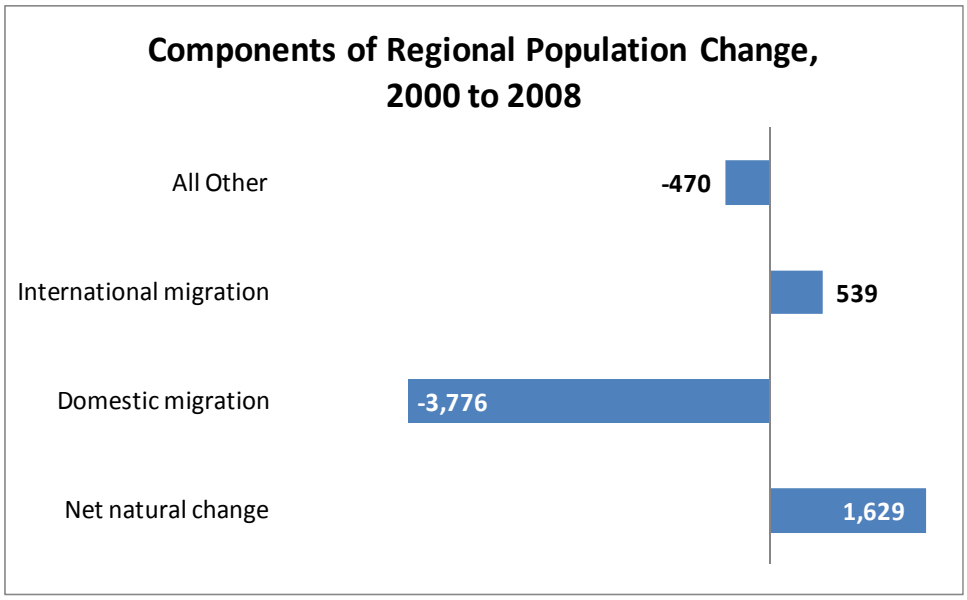

Figure 3

Table 1 demonstrates the population performance of the major communities in the region, the county seats and the largest communities. These communities constitute just over half of the region's population. Both Fairfield and Sigourney have the highest rate of population change at minus 4.6 percent and minus 5.1 percent, respectively. We also see that even though these are the region's major trading centers and centers of county government, they accounted for more than half of the region's population declines. This suggests that population erosion in the region is widespread, and not just an issue facing the smallest communities.

Table 1. Major City Population Changes

	2000	2007	Change
Bloomfield	2,605	2,576	-1.1%
Fairfield	9,602	9,163	-4.6%
Keosauqua	1,068	1,072	0.4%
Oskaloosa	11,079	11,034	-0.4%
Ottumwa	24,996	24,531	-1.9%
Sigourney	2,209	2,096	-5.1%

Table 2 gives us a sense of the region's overall retail and service trade performance. This table lists the trade pull factors of the counties. A pull factor is a measure of whether the region is able to satisfy all of its residents' trade needs within its boundaries. It measures the region's local purchasing activity given its population and income. A pull factor of 1.0 means that the region is statistically self-sufficient, a pull factor of greater than 1.0 means the region is producing goods and services in excess of local demand, and of course, a pull factor of less than 1.0 means that the area is unable to supply all of its citizens' trade and service needs.

Only Jefferson and Wapello County are trade self-sufficient, with Jefferson County demonstrating relatively strong growth in the 2000 to 2008 period, and Wapello County demonstrating a small trade surplus. It is conceivable, it should be noted, that Jefferson County's improvement is a statistical artifact related to its population declining more so than real trade growth. Mahaska County, a micropolitan statistical area, scores just .83, which means the county is satisfying 83 percent of expected sales to its residents. Van Buren and Keokuk have very low values, indicating that the majority of trade and service needs are obtained outside of those counties. It is important to note, however, that the Wapello County value of 1.06 is nowhere near sufficient to offset the losses evidenced in Davis, Keokuk, Van Buren, or even Mahaska Counties. The conclusion regarding the region's trade status is straightforward: overall, on net, it suffers from strong trade leakage.

Table 2. County Retail Trade Pull Factors

	2008	2000
Davis	0.67	0.62
Jefferson	1.01	0.90
Keokuk	0.36	0.33
Mahaska	0.83	0.82
Van Buren	0.45	0.44
Wapello	1.06	1.05

The region's job picture helps us determine the nature of broad employment change happening in the

area. The next figure helps us interpret that change. In general, we look to the private sector to supply the preponderance of job growth in a region because, after all, this is a market economy. The private sector adds either proprietors or wage and salary workers. We can segregate our wage and salary jobs by private sector and/or government sector to get a better sense of private sector performance, and we can separate farm changes from nonfarm proprietor changes.

Figure 4 shows the changes in the region's jobs performance for this decade. In all, the region added more than 1,600 total jobs. It lost 247 farm proprietor jobs and it posted lower government employment. The private sector, however, only added 301 wage and salary jobs and the government sector shed 128 jobs. The region's net gain in jobs came from adding 1,747 nonfarm proprietorships.

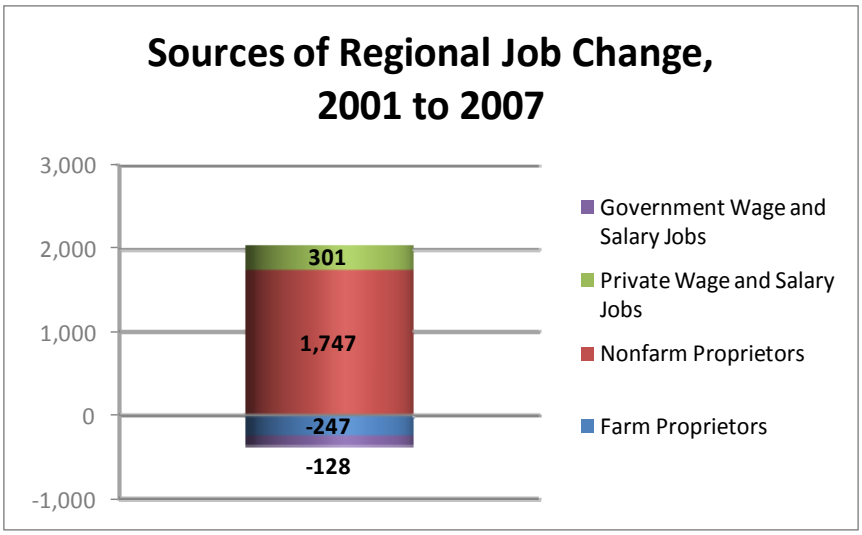

Figure 4

Growth in nonfarm proprietorships normally would indicate regional economic strength– it would lead one to believe that there was a relatively high degree of entrepreneurship activity. However, this outcome for the region indicates quite the opposite: the region is posting gains in nonfarm proprietorships because private and public sector wage and salary growth are meager. Households in the region are using part-time proprietorships to supplement incomes in the absence of more traditional wage and salary growth. This is a recent phenomenon throughout the state of Iowa, but it is more pronounced in more rural areas.

Figure 5 demonstrates the income value of this pattern. Nonfarm proprietor incomes for the region and for the state are compared against the U.S. average. In the 1980s (not shown on this graph), both the

region and the state posted nonfarm income averages that were on par with (i.e., around 100 percent) or greater than the national average. In 2007, the state of Iowa posted a value that was two-thirds the national average. The region, however, had a value that was 43 percent of the national value. There is no evidence that the nonfarm proprietorship growth occurring in the region is sufficient to sustain household incomes. Indeed, the average nonfarm proprietor in the region yielded just over $12,800 in income.

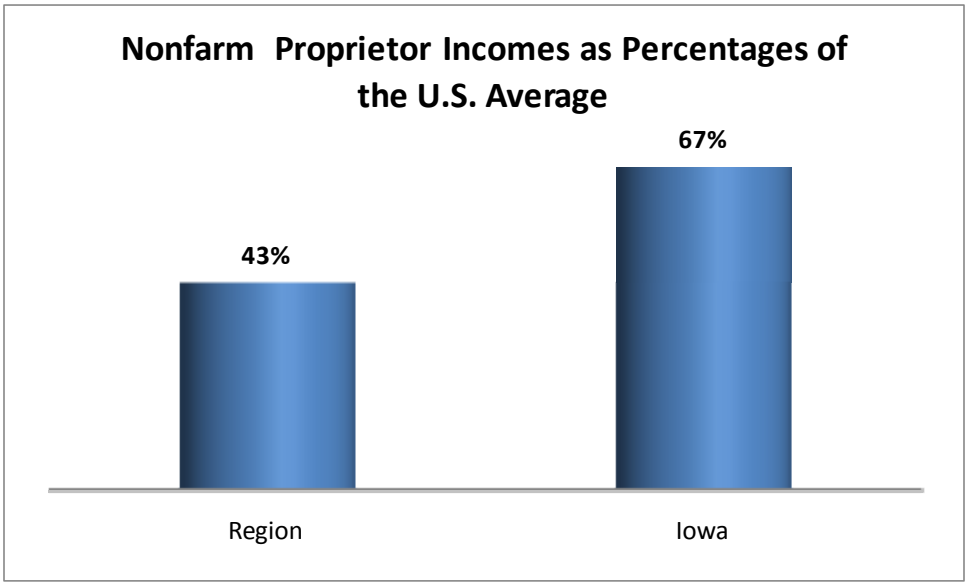

Figure 5

The region's farm sector, like the rest of the state has declined during this decade, though individual county performance has been mixed. There were 4.2 percent fewer farms in 2007 than in 2002 and that value ranged from a decline of 12 percent in Wapello County to an increase of 6.4 percent in Keokuk County.

Table 3. Regional Farm Characteristics in 2007

County	Farms 2007	Change Since 2002	Farms under 50 Acres in 2007	Percent under 50 Acres
Davis	910	-9.6%	207	22.7%
Jefferson	773	-4.3%	165	21.3%
Keokuk	1163	6.4%	274	23.6%
Mahaska	1031	-1.2%	275	26.7%
Van Buren	808	-7.1%	182	22.5%
Wapello	744	-12.0%	255	34.3%
Region	5429	-4.2%	1358	25.0%

Another measure pertinent to this analysis is the number of small farms in the region. The 2007 USDA farm census did a better job than previous censuses of identifying all farm operations, especially those of small farmers. As a result, the survey actually identified a net increase in farms over the previous quinquennial count. Still, a full quarter of the farms in the region were 50 acres or fewer in size. That fraction ranged from 21.3 percent in Jefferson County to a high of 34.3 percent in Wapello County.

The Justification for "Buy Local" Development Strategies

Buying local has been the mantra of local businesses forever. All community leaders are aware that when dollars leave a region they are unlikely to return. A dollar spent in Des Moines, Iowa is rarely reciprocated locally. A dollar spent to buy an apple that originated in Michigan may not find its way back to your local community, except as an indirect benefit.

This actually is the way that modern production economies with mature distribution systems are supposed to work. The overall economy depends on regional producers exporting their specialties to other markets in exchange for goods and services that cannot be produced as efficiently by local entities. That is the system of comparative advantage that cedes corn, soybeans, hogs, laying hens, and cattle production to large swaths of the Midwest, while fruit, melon, and vegetable production are concentrated elsewhere in the United States. By swapping our comparative advantages in the market, by concentrating on our own production efficiencies and shedding less profitable enterprises, we create a more efficient market that ultimately provides more goods at lower costs to all consumers.

This pattern of exchange is a national model of efficient inter-relationships, but it does not preclude the development of locally produced goods, services, or agricultural products to supplement, supplant, or simply replace goods or services that are imported. Regional consumers may prefer to purchase foodstuffs, for example, that are locally produced for a variety of reasons that may contradict standard market assumptions. However, a "buy local" campaign may not be enough to overcome the day-to-day exigencies of maintaining a household at the lowest possible cost, given overall market conditions and the very powerful role that price plays in most purchasing decisions. It should be noted, however, regions currently with competitive advantage, such as California in fresh produce production, may eventually lose that advantage because of lack of water and/or urban sprawl pressures. Examining resource sufficiency for long-term production is beyond the scope of this paper.

Think of a local economy as a simple system of buying and selling. In the first instance, a mature region contains sets of industries and firms that have evolved to satisfy basic needs of regional industries and households. Income is generated in the region because, intra-regionally, we are engaging in local exchanges where money changes hands, but stays in the region. So, the first point of income generation in an economy is the simple but necessary buying and selling that is transacted locally. Next, a region generates income by selling to persons outside of the region. Those sales are called exports, and the money that they bring into the region sustains a level of employment that would not otherwise exist were it not for the exports. We immediately offset these gains by discounting all of the things that we

must import from outside of the region. Those imports may come from China, California, or the Quad Cities. Regardless of their origin, if they are not produced within the region, they are imports and the money required to purchase them leaves the community.

It is therefore axiomatic that the two most elemental ways to boost a regional economy are to increase exports or minimize imports. While export expansion is the most desirable course of action as it creates more and higher-paying spinoff jobs, import substitution also creates a multiplier effect within the local economy. The level of local benefit depends on the kind of commodity or service for which the substitution is taking place.

Were one to promote local production of fruits, vegetables, and other farm products as a local economic development strategy, there are three overriding considerations:

1. What do people actually eat?
2. Can the commodity be grown/raised efficiently in this area?
3. Can producers realize an income from the activity?

The first consideration is very important. It is unwise to promote local production for local consumption without having a very good sense of the region's average tastes and preferences. It also is unwise in the short run to begin such an inquiry with an assumption that people *should* be eating a particular commodity. For economic development planning and for general community development in particular, we rely heavily on revealed preferences. That is, the consumer, through the market, is telling us what he or she wants.

The second key consideration is that farmers know what can and cannot be grown in Iowa, but the question is whether something that can be grown also can be produced efficiently? Efficiency in production means that there are means or access to means by which to sow, cultivate, harvest, store, and distribute the goods on a timely basis. The region's climate also cannot be ignored. Where other areas of the United States may be able to double or triple crop over the course of a year, in Iowa farmers usually get one shot at producing fruits or vegetables annually, although the current use of high tunnels in vegetable production show great promise to extend the growing season.. This type of production efficiency is important to determining the profit potential from the activity.

In economics, the last consideration is most important. If the producer can achieve a return as good or better for his or her efforts as a use for which his or her land and labor could have otherwise been used, then the producer will continue to engage in that behavior. In short, can income be made? And if so, is it sufficient to warrant the effort? This last question is what matters, because if it is not, if the effort ends up as a mere supplement to income (as was described in the nonfarm proprietorship growth), then serious questions can be raised about the long-term durability of the import substitution enterprise.

The local farmer does not need to make as much per acre as a producer from California or Michigan for the enterprise to be worthwhile; he or she just needs more than the alternative uses to which the land can be put in Iowa. In the short run, the farmer is not competing against external producers, just the opportunity cost of switching to this form of production versus the status quo.

The Region’s Local Foods Scenarios

This region chose an initial set of eight fruits and vegetables to evaluate (tomatoes; peppers; greens such as kale, chard, and cabbage; squashes; beans; potatoes; eggplants; and apples). Along with those items the region chose chicken, egg, and lamb and meat goat production as potential items for boosting local production and sales.

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A Brief Look at Statewide Fruits, Vegetables, and Melon Potential

In preparing for this analysis, the overall capacity of all counties in Iowa to produce vegetables, fruits, and melons was determined. Working through the state-level numbers is instructive in explaining the scenario values that were developed for this region. In Table 4 we see that the top 15 crops (of 37 total) accounted for 97.3 percent of all produce on an acres basis, and the top 15 crops on a per farm basis accounted for 82 percent of all farms that were producing these commodities. The weighted averages also are important. The average number of acres per farm that were producing all fruits, vegetables, and melons was 3.2. That value (for this list of 15 items) ranged from a high of about 8.7 acres for the average sweet corn farm, to just half an acre for tomatoes. If total sales of fruits and vegetables were $20.4 million, then these 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 fruit and vegetable production as practiced at the farm level in Iowa represents a very small portion of household incomes.

Table 4. Top 15 Fruit, Vegetable, and Melon Production by Acres and by Farm Numbers in Iowa, 2007

Top 15 in Total Acres	Acres	Cumulative Percent of Total	Top 15 in Total Farms	Farms	Cumulative Percent 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	

Using the Iowa Produce Market Calculator to consider 22 of the 37 items listed in that utility, it was determined how many acres of land would be needed to produce those commodities given Iowa's overall production characteristics and climate, and the state's per capita consumption.[1] These specific items are displayed in the next table, and their values are displayed in the next figure.

[1] These are the 37 fruits and vegetables that constitute the unabridged version of Table 4: 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 5. 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 takes 30,253 acres to produce the 22 primary fruits and vegetables that Iowans consume annually. Iowa, however, cannot grow crops all year long. When we factor in seasonality, we lower the potential acres for producing fresh fruits and vegetables for our own consumption to 12,226 acres using Iowa production characteristics and the factors contained in the Iowa Produce Market Calculator. Current production of those major fruits and vegetables in Iowa required 8,391 acres in 2007, though that acreage total is heavily dominated by sweet corn.

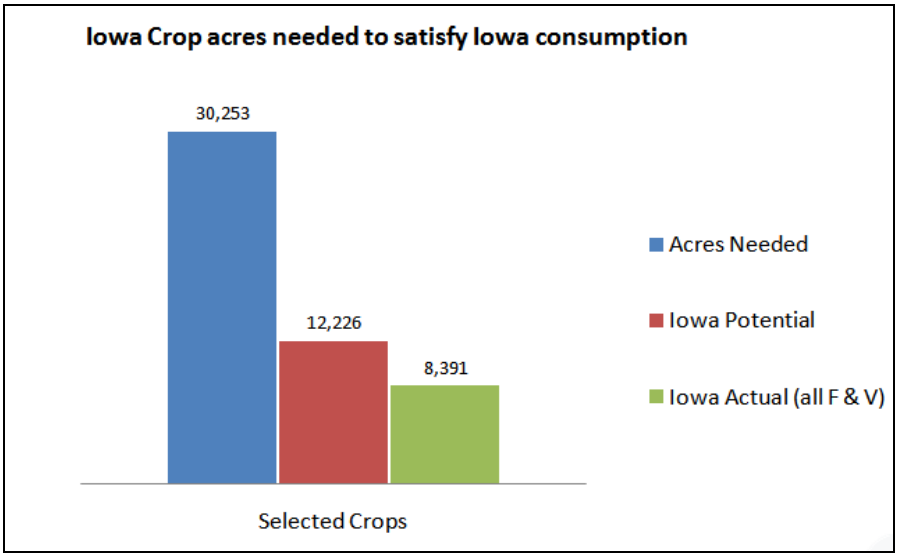

Figure 6

From the outset, it is important to note that the potential growth in acres needed to produce enough for seasonal consumption in Iowa is relatively small. To put it into perspective, the average county in Iowa contains 240,300 acres of harvested cropland. The 12,226 new acres that would be required to produce enough of these 22 fruits and vegetables *for the entire state* (considering Iowa's growing season) would constitute 5.1 percent of the cropland *in only one county*.[2]

The Region's Fruits and Vegetable Production Potential

The same process was used to ascertain the region's potential for all fruit and vegetable production versus the region's existing production. The first step involves looking at the total demand for the 22 major commodities that constituted the larger analysis. Were the region able to grow its entire annual consumption of 22 fruits and vegetables, it would require 1,185 acres. This cannot occur, given seasonal constraints, so an adjustment is made for the region's seasonal requirements of these fruits and vegetables to be grown on 528 acres, or 88 acres per county in the region. If the region chose to concentrate on eight fruits and vegetables, the Iowa Produce Market Calculator estimated that it needed 215 net new acres for that scenario, slightly less than 36 acres per county.[3] These acres already include estimates of existing production under either scenario, so the acre needs are considered new relative to these commodities.

[2] In an assessment where all 37 fruits and vegetables were produced, my 2006 research found that it 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 full 37 items.

[3] The Iowa Produce Market Calculator, using USDA county-level production statistics, estimates whether there is existing production of a particular commodity in an area. Consequently, the acres needed already have accounted for existing production.

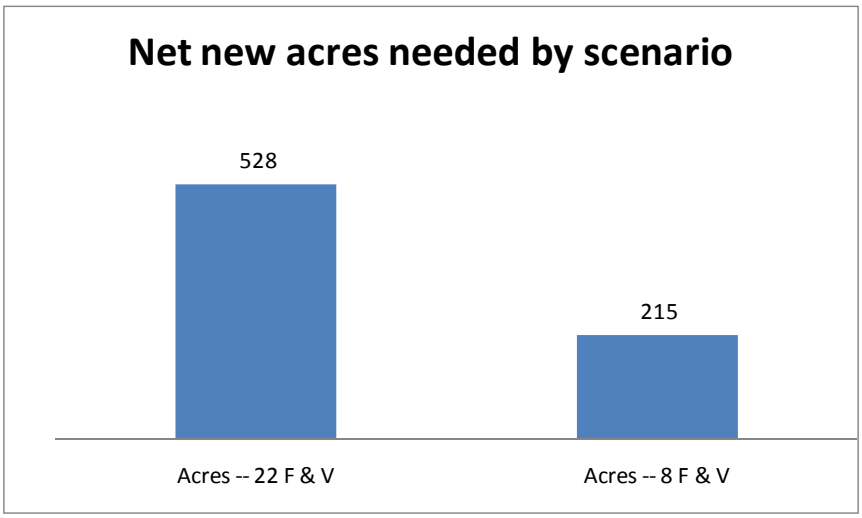

Figure 7

Calculating Economic Impacts from Increased Production

There are two economic impact calculations that can be compiled for these scenarios. The first considers only the value of the fruit and vegetable production as a total portion of the regional economy. The next calculation considers exactly how much net new productivity is happening in the region after we account for existing fruit and vegetable production, and after we subtract productivity from conventional farming (a corn/soybean rotation) on the acres that would be needed to produce the incremental gains in fruits and vegetables.

An input-output model of the region was constructed to determine the region-wide consequences of the scenarios. An input-output model tracks the transactions among industry groups within a region and can be used to project total job, labor income, and gross sales changes due to either an increase in export production or through an unarguable import substitution. As enhanced local foods production is an import substitution, we can declare that the effects constitute a net gain in regional productivity and, hence, a positive regional economic impact.

In calculating the impact assessment, we need to assemble a table of basic direct values from which to operate. For this analysis, we need to know net new acres per scenario, the farm value of the sales, and the output adjustment to conventional farming if those acres are diverted to fruit and vegetable production. Table 6 contains those values.

Table 6. Basic Assumptions for Farm Level Impacts

Acres -- Existing F & V Production	274
Acres -- 22 F & V	528
Acres -- 8 F & V	215
Farm Sales Value -- Existing F & V Production	$706,000
Farm Sales Value -- 22 F & V	$1,353,226
Farm Sales Value -- 8 F & V	$605,099
Corn and Soybean Offset -- 22 F & V	$160,075
Corn and Soybean Offset -- 8 F & V	$65,152

The region has 274 existing fruit and vegetable (F & V) production acres, some of which are producing for local consumption and some of which likely are producing for export sales outside of the region. The net new acres needed to meet the particular fruit and vegetable production scenarios in this study already consider local production. So the acres converted under either scenario will be considered new fruit and vegetable production acres for our subsequent analysis. These acres will have to be taken away from existing soybean and corn acres, however, because we assume that all productive land for crops already is under cultivation. The estimated value of fruits and vegetable production for the two scenarios was determined by the Iowa Produce Market Calculator. The value of production was obtained from the regional input output model, as were the values of the corn and soybean production on the required acres.

Table 7 shows the economic values of the current fruit and vegetable production system that were identified in the input-output model. That table will be used to introduce the results of the analysis as well as to define the terms. Three types of economic activity are reported. The first is *output*, which is sales value of all goods or services that are produced. The next is *labor income*, which is composed of all wages and salaries to workers, the value of all employer-provided benefits, plus the returns to management that would accrue to sole proprietors like farmers or shopkeepers. The last measure is *jobs*. There are more jobs in the economy than employed persons because many people have more than one job.

Next, the model produces three types or rounds of economic activity. We first report the *direct values*. These pertain to the firm we are studying. Reported next are the *indirect values*, the purchase of inputs from regional suppliers by the direct firm or firms are in business, which in turn stimulate job demand in those supplying industries. Reported next are the *induced values* which occur when the workers in the direct and indirect industries convert their labor incomes into household spending. This stimulates further economic activity in the region as it produces goods and services for households. When we add all of these values, we get the *total economic values* for each type of economic activity measured.

In Table 7 we find that the region's existing direct output, the farm level sales value of fruit and vegetable production, is $706,000. Producing that output required 3.8 jobs that earned $195,504 in labor income, to include payments to the farmer/owners. The region's producers required another $133,459 in inputs, which sustained 1.6 jobs in the supplying sectors making a total of $48,717 in labor incomes. When workers in the direct and indirect sectors converted their labor incomes into household savings they induced another $121,283 in output, which required 1.4 jobs and $37,357 in labor incomes to provide. In total, regionally, $960,742 in output, $281,578 in labor incomes, and 6.8 jobs in the region are attributable to fruits and vegetable production.[4]

Table 7. Existing Regional Fruit and Vegetable Production

Existing Production	Direct	Indirect	Induced	Total	Multiplier
Output	706,000	133,459	121,283	960,742	1.36
Labor Income	195,504	48,717	37,357	281,578	1.44
Jobs	3.8	1.6	1.4	6.8	1.79

Table 7 also lists a multiplier. A multiplier is the total value divided by the direct value, and it shows the degree to which the total economy links to a one-unit change in the direct values. An output multiplier of 1.36 means that for every $1 of direct output in this industry, $.36 in additional output sustained in the indirect and induced sectors. The labor income multiplier of 1.44 means that for every $1 of labor income paid in the direct sector, $.44 in labor income is sustained in the rest of the economy. Finally, the jobs multiplier of 1.79 means that for every job in the direct industry there are nearly 8/10^{ths} of a job sustained in the rest of the region.

Table 8 summarizes the eight-item scenario first. When all rounds of economic activity are considered, the production of eight fruits and vegetables to satisfy seasonal demand would boost total regional output by $823,433, labor incomes by $241,335, and sustain 5.9 jobs.[5] By so doing, however, we would reduce the total regional economic value of corn and soybean output on that land by $88,600, regional labor incomes as a result would go down $25,985, and there would be .6 fewer jobs.

Accounting for the corn and soybean offsets shows the net expected boost to the regional economy considering just the net farm level of production gains. Regional industrial output would grow by $734,773, labor incomes by $215,350, and there would be 5.3 more regional jobs.

[4] The activity is measured as if it were annualized, which can be a problem for part-time or seasonal job activities like food production. For example, the direct jobs numbers during the season may be four times as great but the workers may only work a quarter of the year at that job.

[5] In assigning a "seasonal" value to these items, most were assumed to be available for three months. Those that store more easily (such as potatoes) were given longer seasons for availability and could therefore satisfy more demand and require more acres.

Table 8. Eight Fruits and Vegetables Production Scenario

Farm Production	Direct	Indirect	Induced	Total	Multiplier
Output	605,099	114,386	103,949	823,433	1.36
Labor Income	167,563	41,754	32,018	241,335	1.44
Jobs	3.2	1.4	1.2	5.9	1.84
Corn and Soybean Offsets	Direct	Indirect	Induced	Total	Multiplier
Output	-65,152	-12,316	-11,192	-88,660	1.36
Labor Income	-18,042	-4,496	-3,447	-25,985	1.44
Jobs	-0.3	-0.2	-0.1	-0.6	2.00
Net Regional Gains	Direct	Indirect	Induced	Total	Multiplier
Output	539,947	102,070	92,757	734,773	1.36
Labor Income	149,521	37,258	28,571	215,350	1.44
Jobs	2.9	1.2	1.1	5.3	1.83

Table 9 gives the results for the 22 fruits and vegetables scenario. This would boost farm output by $1.841 million, labor income by $539,714, and support 13.1 jobs in the region. As land was removed from corn and soybean farming, we would lose $217,834 in regional output on that land, $63,844 in labor incomes, and 1.5 jobs. The net gain to the region would be $1.623 million in regional economic output, $475,870 in labor incomes and 11.6 jobs.

Table 9. Twenty-Two Fruits and Vegetables Production Scenario

Farm Production	Direct	Indirect	Induced	Total	Multiplier
Output	1,353,226	255,808	232,468	1,841,503	1.36
Labor Income	374,733	93,378	71,604	539,714	1.44
Jobs	7.2	3.1	2.7	13.1	1.82
Corn and Soybean Offsets	Direct	Indirect	Induced	Total	Multiplier
Output	-160,075	-30,260	-27,499	-217,834	1.36
Labor Income	-44,328	-11,046	-8,470	-63,844	1.44
Jobs	-0.9	-0.4	-0.3	-1.5	1.67
Net Regional Gains	Direct	Indirect	Induced	Total	Multiplier
Output	1,193,151	225,548	204,969	1,623,669	1.36
Labor Income	330,405	82,332	63,134	475,870	1.44
Jobs	6.3	2.7	2.4	11.6	1.84

Direct Marketing Impacts

While the gains at the farm level are noticeable under either scenario, there may be opportunities for the region's producers to add more value to their operations. In our previous research conducted at both the state and the regional levels, we configured sets of direct sales centers where local producers also sold some fraction of their produce in direct sales to consumers. That research involved the virtual fabrication of a local fruits and vegetables facility that would directly market up to 50 percent of all regional production. The remainder would be distributed regionally via traditional wholesale or other direct sale outlets for local sales.

Applying that same methodology to this region requires some very basic assumptions:

- Producer-seller operations will be basic businesses that concentrate solely on the seasonal sale of the fruits and vegetables grown locally.
- The operations' costs are configured assuming only four months of operation to distribute the seasonally-grown commodities.
- The producer-seller operations will be arrayed regionally in sufficient numbers to meet the needs of the existing population.
- Gains to the producer-sellers have to take into account losses to existing grocery stores in the region.
- The producer-sellers will directly market 50 percent of their seasonal production, and the remaining 50 percent will go to existing wholesale operations.
- The average returns to producer-sellers are higher than would be the case from grocery stores as there is an assumption that significant transport and other operational cost savings are realized by the producer-sellers.
- No calculations are made for lost trucking and warehousing activity that would have delivered these goods and services to regional grocery stores. It is assumed that all of that economic activity originates external to the region and is irrelevant for our analysis.

Relying on the Iowa Produce Market Calculator, we also can arrive at retail values for the commodities produced under the two scenarios. These are the increments to production and the foundation from which the relative losses to retailers must be considered:

- If 50 percent of the first scenario were directly marketed, the retail value of those commodities would be $772,834. This would offset retail sales margins by a value of $308,902.
- If 50 percent of the second commodity were directly marketed, the retail value would be $1,649,132. This would offset retail sales margins in the region by $659,158.

The modeling values between the two are different because retail activities, like grocers, are treated differently in the modeling system than other sectors. In the retail and wholesale sectors, the value of output includes only the cost of indirect inputs plus labor and payments to owners or investors, not the cost of goods sold. The value of the cost of goods sold are "margined" to the transport sector on to the manufacturers/processors and producers. In this exercise, we leave the full retail value within the model as we assume that the full value of transport and production costs is allocated to the producer/ sellers. We do not, however, double count by having the price paid at the farm gate count as an input. Like the grocers, in this modeling exercise, the farmers already have been paid for all farm-level activity.

Table 10 displays the regional direct marketing values for the eight-item scenario. The virtual fruit and vegetable stores would directly or indirectly support $1.042 million in regional output, $393,071 in labor incomes, and 22.7 jobs. This analysis assumes that the direct sales facility is open for business for four months yearly. As grocery store sales decreased, we would see $407,489 in reduced output, $153,726 in reduced labor income at the stores, and 8.1 jobs lost. The net gain to the region would be $634,701 in output, $239,345 in labor incomes, and 17.7 jobs.

Table 10. Eight Fruits and Vegetables Direct Sales Scenario

Direct Sales	Direct	Indirect	Induced	Total	Multiplier
Output	772,834	119,301	150,056	1,042,190	1.35
Labor Income	312,645	38,508	41,918	393,071	1.26
Jobs	22.7	1.3	1.7	25.8	1.14
Grocer Offsets	Direct	Indirect	Induced	Total	Multiplier
Output	-308,902	-39,029	-59,559	-407,489	1.32
Labor Income	-124,461	-12,606	-16,659	-153,726	1.24
Jobs	-6.9	-0.4	-0.7	-8.1	1.16
Net Direct Sales Gains	Direct	Indirect	Induced	Total	Multiplier
Output	463,932	80,272	90,496	634,701	1.37
Labor Income	188,184	25,902	25,260	239,345	1.27
Jobs	15.8	0.9	1.0	17.7	1.12

Table 11 reveals the same process for the 22-item scenario. The direct sellers would contribute $2.224 million in increased regional output, $838,765 in labor incomes, and 55 jobs. Considering reduced grocer sales, the accompanying regional losses would be $869,532 in output, $328,032 in labor incomes, and 17.2 jobs. In the end, the region would see $1.354 million in enhanced output, $510,733 in labor incomes, and 37.8 jobs.

Table 11. Twenty-Two Fruits and Vegetables Direct Sales Scenario

Direct Sales	Direct	Indirect	Induced	Total	Multiplier
Output	1,649,132	254,574	320,200	2,223,906	1.35
Labor Income	667,146	82,171	89,448	838,765	1.26
Jobs	48.5	2.9	3.7	55.0	1.14
Grocer Offsets	Direct	Indirect	Induced	Total	Multiplier
Output	-659,158	-83,282	-127,092	-869,532	1.32
Labor Income	-265,585	-26,899	-35,548	-328,032	1.24
Jobs	-14.8	-0.9	-1.5	-17.2	1.16
Net Direct Sales Gains	Direct	Indirect	Induced	Total	Multiplier
Output	989,974	171,292	193,108	1,354,374	1.37
Labor Income	401,561	55,272	53,901	510,733	1.27
Jobs	33.7	1.9	2.2	37.8	1.12

The combined impacts of increased production and the direct sales scenarios are summarized next. With the eight fruits and vegetables scenario, total regional output would increase by $1.37 million, labor incomes by $454,695, and 23 jobs would be sustained. With the 22 produce items scenario, regional output gains would be $2.98 million, and 49.4 jobs would receive $986,603 in labor incomes.

Table 12. Combined Producer and Direct Sales Impacts

Eight Fruits & Vegetables	Direct	Indirect	Induced	Total	Multiplier
Output	1,003,879	182,342	183,253	1,369,474	1.36
Labor Income	337,705	63,160	53,831	454,695	1.35
Jobs	18.7	2.1	2.1	23.0	1.23
Twenty-Two Fruits & Vegetables	Direct	Indirect	Induced	Total	Multiplier
Output	2,183,125	396,840	398,077	2,978,043	1.36
Labor Income	731,966	137,604	117,035	986,603	1.35
Jobs	40.0	4.6	4.6	49.4	1.24

Meat Products and Eggs

It has been clearly demonstrated that Iowans and residents of the study region import the vast majority of the fruits and vegetables that they consume. The region, however, is a net exporter of most meat products. We can gauge regional production self-sufficiency by calculating a value called a location quotient (LQ). There are several types of LQ values that can be determined, but the most common involves the percent of all jobs in a particular industry regionally compared to the same percentage at the national level. Using that metric we can determine, broadly, where the region has agricultural production strengths and weaknesses.

A location quotient of 1.0 or greater means that an area is considered self-sufficient in the production of a major commodity. A value of less than 1.0 means that the area is unlikely to be self-sufficient and must import commodities to meet the needs of its population. It is evident from Table 13 that the region has virtually no vegetable, melon, or fruit farming activity – those commodities must be imported. The region is, however, a strong performer in oilseed and grain farming, all other crop farming, cattle ranching and farming, and all other animal production. This sector is dominated by the hog industry. The value of 16.73 means that, using jobs as the determinant, the region has 16.7 times more employment in that sector than would be needed to satisfy all local demand. The region barely breaks even in dairy cattle and milk production, and it posts a minor regional deficit in poultry and egg production, a category that we will explore further for this study region.

Table 13. Regional Agriculture Sector Location Quotients (LQ)

Activity	LQ
Oilseed farming	11.97
Grain farming	8.84
Vegetable and melon farming	0.03
Fruit farming	0.06
Greenhouse- nursery- and floriculture product	0.12
All other crop farming	2.30
Cattle ranching and farming	4.95
Dairy cattle and milk production	1.05
Poultry and egg production	0.82
Animal production- except cattle and poultry	16.73

Another location quotient analysis was conducted to ascertain whether the region was in fact self-sufficient in lamb and goat production, as well as evaluating the area's poultry and egg production statistics. This LQ was determined using 2007 agriculture census sales values for the region per capita, as compared to national averages, to determine whether the region indeed had deficits in both lamb and goat production and in chicken and egg production. The chicken and egg production statistic is interesting because Iowa is the nation's leader in layer hens and egg production, yet the region is not self-sufficient by this measure.

Table 14 contains those values. Based on data that were not suppressed for three of the region's counties, that method also suggested the region had a comparative deficit in egg and poultry production. It can be assumed, therefore, there are gains to be made for the regional economy by boosting local production.

The lamb and goat data from the U.S. agricultural census indicate the region has a production surplus of these animals. There are ample supplies for local consumption based on national consumption rates. This means there is no evidence of a deficit of supply and an import substitution strategy would not be appropriate to the region from the production side. While it is not practical to suggest expansion of production to meet local needs, it may, however, be the case there are not enough small meat processors to supply directly to local consumers. That is, rather than substituting for production, the region might consider substituting for processing. That consideration is dealt with later in this section.

Table 14. Sales Based Location Quotients

Group	LQ
Chickens / Eggs	0.66
Lambs / Goats	8.33

Regardless, we can use the input-output model to estimate the potential growth in chicken and egg production that would be required to make the region statistically self-sufficient from a farm production standpoint, but not a local consumption standpoint. Our model indicated the region made $23.072 million in poultry and egg sales or gross output. We extrapolate the amount of sales needed to make the region self-sufficient by dividing sales by the LQ in Table 13 (the model-driven LQs) and then taking the difference between the two amounts:

- $23.072 million / .82 = 28.137 million
- The difference between that amount and actual sales is $5.065 million. That is the increment to production that can potentially be promoted in the region to achieve a location quotient of 1.0.

Those sales values than were entered into the input-output model to determine the economic impacts that might accumulate. In Table 15 we find that given average regional poultry and egg production characteristics, $5.065 in industrial output only requires 4.9 jobs, but the labor income involved with that production is $329,164, which would include the returns to the farmer. In producing that output, the farmers would require $1.478 million in regionally-supplied inputs, which called for 11.1 jobs making $275,428 in labor income. Note that these inputs do not include regionally-supplied feeds as that productivity already existed in the area. When the direct and the indirect workers convert their pay into household spending, they induce $253,388 in additional output, which relies upon 3.8 jobs making $48,874. In all, this level of increased productivity would yield $6.8 million in expanded regional output, $653,466 in boosted labor incomes, and 19.8 jobs.

Table 15. Potential Regional Gains From Poultry and Egg Production Statistical Self-Sufficiency

	Direct	Indirect	Induced	Total	Multiplier
Output	5,063,000	1,478,167	253,388	6,794,555	1.34
Labor Income	329,164	275,428	48,874	653,466	1.99
Jobs	4.9	11.1	3.8	19.8	4.04

Table 15 offers a production scenario where the region is able to produce poultry and eggs at the national average, all things being equal. It represents a regional production shift, but it does not necessarily mean that production will result in more local consumption. That is a different consideration. For that reason, it is not appropriate to add Table 15 to the values shown in Table 12 to obtain a local consumption total.

Regional retail purchases of poultry and eggs for in-home use are not as easily estimated because they are common commodities found in a wide array of processed foods and in the foods that we consume away from home. Table 16, however, gives an estimate of the total amount of, for example, chicken and egg consumption in the United States and by extrapolation in the region.

Assuming that 50 percent of each commodity by volume is purchased at the retail level, and assuming (just as above for the fruits and vegetables) that the region's goal was to provide up to 25 percent of that volume from local producers, the regional retail value of those sales would be $1.45 million for chickens and $435,240 for eggs.

Table 16. Estimating a Local Foods Retail Value for Chicken and Egg Production

	Chicken	Eggs
National annual consumption per capita	87 pounds	21.6 dozen
Study region consumption	9,048,000	2,246,400
Percent sold for in-home use	50%	50%
Percent of in-home locally supplied	25%	25%
Retail price per unit	$1.28	$1.55
Potential retail value	$1,447,680	$435,240

These products are not affected by seasonality, so the 25 percent limitation may be unnecessarily restrictive, but it does provide a sense of the retail potential. I did not apply a direct marketing component to this sector as I did in the fruits and vegetables analysis, and I would argue that it would be more important to local producers to have a predictable and stable marketing relationship with local merchants than to establish their own direct sales outlets.

Establishing Regional Meat Processing Capacity

The U.S. Department of Commerce tallies 99 Iowa slaughtering and meat processing firms that have fewer than 20 employees. We commonly refer to these operations as locker plants. The southeast Iowa region, according to the same source, has only four such small operations. One of the necessary requirements to encourage locally grown meat product sales is local processing capacities. As the region has, according to our calculations, production surpluses in lamb and goat supplies, the absence of local processing capacities would be an impediment to local consumption. This also would be an issue impeding locally raised chicken sales for the area.

The region's demand for lamb/goat products, however, needs to be put into perspective. At the national level, the average American consumed just one pound of either commodity in 2007. For the region to distinguish itself from the national average, then, it would have to substitute lamb/goat products for other meat products. In our scenarios those candidates would be beef and swine products, of which, the combined national average consumption is 117 pounds per capita, and of which the region is a major exporter. Net increases in local consumption of one existing regionally-produced commodity over another already-produced commodity yield no net productivity gains to the region, so there are no import substitutes to declare at the production level.

However, if meat imports consumed locally are processed outside the region, an import substitution case can be made. We can consider the addition of small processors to the region as a potential intermediate enabling industry to support greater sales of locally produced meat products. If area demand for locally produced meats is strong enough to sustain additional processing capacity, and if additional processing capacity helps to assure an adequate supply of locally produced meat products, then we can estimate the regional impacts per firm. Remembering that the region is considered completely self-sufficient in beef, pork, and lamb/goat production, a case can be made that there is an evident deficit of lamb/goat or smaller volume poultry slaughtering and processing capacity. If that is the case, the addition of that processing capacity could serve as an import substitute for beef products that are processed outside of the region.

Table 17 lists those values. Using the estimated average of meat processing firms in Davis, Jefferson, and Van Buren counties as the expected values, the following economic impacts are possible for small meat processing . The firm would need 2.6 jobs (to include the proprietor) making $97,282 to combined labor incomes. The firm would buy (excluding the animals for processing) $276,232 in inputs regionally, thereby boosting jobs in supplying firms by 1.7 and $63,676 in labor income. Induced sales would be

$63,166 requiring 8/10th of a job making $17,879. The region's output would increase by $1.47 million and labor incomes by $178,937, and 5.1 jobs would be added per new small processing firm established.

The values in Table 17 also hold if the region's existing firms expand production to meet increases in local demand for lamb/goat meat or locally-raised poultry. The added firms also represent a desirable opportunity for the region because two counties (Mahaska and Wapello) currently do not have small meat processors.

Table 17. Potential Regional Impacts Per Small Meat Processor Addition to the Region

	Direct	Indirect	Induced	Total	Multiplier
Output	1,130,000	276,232	63,166	1,469,399	1.30
Labor Income	97,382	63,676	17,879	178,937	1.84
Jobs	2.6	1.7	0.8	5.1	1.96

Conclusions and Perspectives

Local foods re-introduction and enhanced local consumption are in their infancies in this region and in much of the Midwest. This study determined, given the amounts of local fruits, vegetables, and meat products that are produced, processed, and consumed, the region might benefit from the addition of from nearly 50 jobs at the conservative end to 75 jobs were more fruits and vegetables produced.

Many local foods promoters might wonder that these job numbers are much too small. They are not, and given the scenarios that have been analyzed they are very reasonable. Proponents and producers must take careful stock of the fact that a relatively small amount of land generates enough produce to feed a large number of people. In this case 528 acres of production would yield 25 percent of 22 fresh fruits and vegetables consumed annually for 100,000 persons in the region. The amount of labor to efficiently farm, harvest, and maintain those acres is relatively small, assuming modern production practices.

Still, the scenarios produce net farm and regional income gains of almost $1 million under the 22 fresh fruits and vegetables options, to include the gains of farmer retailers along with all multiplier effects. Those gains come primarily from substituting local production for imported goods. Accordingly, the strategy boosts the region's economy and results in true economic impacts.

Fresh fruit and vegetable production for local consumption is the first stage of local foods reintroduction and re-establishment in the Midwest. Greater potential economic impacts can be generated by other value added activities, to include the reintroduction of local food processing as well as developing systems that allow for longer growing seasons and longer storage.

Over the very long term, the viability and durability of local foods production will depend on a durable and dependable regional market. Regions with vibrant urban centers with diversified economies will support local foods systems much more readily than more remote areas with lower collective disposable incomes. Farmers with close-by dense demand will find profitable opportunities that might elude other producers in more rural regions. This research, however, contained a mix of micropolitan counties and less developed areas, and it demonstrated the there are modest, yet meaningful gains to be achieved in local economic wellbeing as a result.

Local foods research is in its embryonic stages. There are few regional economic studies and few actual measures of the viability of local foods production given historical production patterns. While economists and promoters may specify models and scenarios for analysis, the proof in the movement occurs when producers generate profits that in themselves are sustainable. In short, the success of local foods efforts on both small and large scales will be demonstrated in the market, and the future will reveal just how far local foods production will evolve over the next few years. Researchers will help producers and promoters understand the value of the possibilities, but ultimately it is producers that will assume the risks.

There are many technical aspects of local foods production that will need to be worked out before the risks to producers and to regions are understood. Feasibility studies will need to be conducted so that

farmers understand costs and constraints to production. Importantly, regional consumer sentiment will also have to be gauged. One must not lose sight of the very important historical fact that consumers have shifted away from locally produced goods and services over the years, and changing that trend might be difficult. Last, policy makers and promoters must be informed of the research based potential economic and community gains and the uncertainties that must be acknowledged about those gains so that policies reflect reality and future prospects are well understood.

There are other dimensions to local foods development that have not been assessed in this research but should be addressed in subsequent research. Local trade involves face to face transactions among local residents. Those are as much social transaction as they are economic transaction. Community cohesion depends on face to face and regular interactions economically and socially and a well-defined sense of just who is part of a local community. Enhanced local foods production allows for rural producers to re-insert themselves into the fabric, structure, and well-being of rural communities and creates the potential for reestablishing a cognitive understanding between food production and consumption among urban dwellers.

In the end, mere economic gains may be the least of the reasons for promoting local foods production and consumption among community members.