

# **The Food System as an Economic Driver: Strategies and Applications for Michigan**

**Title:** The Food System as an Economic Driver: Strategies and Results from Michigan

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**Abstract:** Transition to a more local, sustainable food system has the potential to help address many chronic problems facing communities across the country. We present results of an input-output analysis for Michigan measuring income and job impacts of a scenario in which residents meet USDA fruit and vegetable consumption guidelines by eating more seasonally available Michigan grown fresh produce. Our study finds that almost 2,000 jobs and \$200 million in new income would be created. We relate this to initiatives on the state, regional and community level engaging broad stakeholder groups and creating opportunity for increased access to locally grown foods.

**Keywords:** input-output model, fruit and vegetable consumption

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## **Introduction**

Scholars are increasingly recognizing the connections between food and agriculture systems and a set of broader outcomes, such as public health, the environment, civic engagement and economic opportunity. It is suggested that a more sustainable food and agriculture system, with greater emphasis on local markets, can bring an array of benefits to society at large<sup>1, 2</sup>. Our research specifically focuses on the intersection of food and agriculture, public health and economics; highlighting opportunities in Michigan to link these arenas for mutual benefit.

In recent years, Michigan's economic performance has been among the worst in the nation by several key measures. In summer 2007 the state's unemployment rate was the highest in the nation and reached its highest level since 1993<sup>3</sup>. Concomitantly, Michigan's public health indicators that relate to diet are also among some of the worst in the country<sup>4</sup>. Poor health exacts great direct and indirect economic costs. In the US as a whole, annual direct medical costs of obesity are \$61 billion, with estimated overall economic cost of obesity in the US to be \$117 billion annually<sup>4</sup>. Michigan residents incur high insurance premiums, a finding attributed largely to diet-related factors<sup>5</sup>. These high health care costs are seen as negatively impacting the automobile industry, a traditional driver of Michigan's economy, as well as small business<sup>6, 7</sup>. Nonetheless, food and agriculture continue to be vital components of state's economy<sup>8</sup>; accounting for \$60 billion of economic activity and 1.05 million jobs annually.

Certainly, one cannot establish a sole causal link from food and agriculture through diet and health to economic vitality and unemployment. We do propose, however, that a more localized, sustainable food and agriculture system is an important component in addressing these problems and creating opportunity for improvement. A recent paper in this journal <sup>9</sup> highlights the potential of a healthy food system in addressing a myriad of deep and persistent problems using systems science to demonstrate problem interconnectedness and suggesting the value of addressing them in an integrated and holistic manner.

By understanding and articulating the interconnectedness of food and agriculture, public health and economics we can create opportunity for broad discourse on potential solutions to a variety of problems. In order to effectively address food related public health issues, it is imperative that a broad array of policy and decision makers be engaged in supporting potential solutions. We contend that incorporating an analysis of the economic development potential of these efforts to create more localized, sustainable food systems is absolutely essential and creates opportunity to engage those who may otherwise be less than enthusiastic.

A number of studies have dealt with the current economic impact of food and agriculture, or forecast change impacts. Several groups have utilized input-output models, many utilizing the Regional Economic Models Inc. (REMI) and IMPLAN packages, to analyze the potential economic impact of shifting agricultural production towards greater fresh market fruit and vegetable production. REMI and IMPLAN are software packages that

measure the economic impacts of new businesses, industries and other changes in one part of the economy on the total economic impact of an area. Cantrell et al. utilized the REMI model and reported that Michigan farmers could generate almost 2,000 new jobs and \$200 million in new personal income by shifting their emphasis from processed to fresh wholesale and direct market production<sup>10</sup>. Swenson's study from Iowa utilized the IMPLAN® model and posed various scenarios of residents substituting increased consumption of locally grown produce; including one where Iowans meet USDA guidelines with in state fruits and vegetables, generating \$430 million and more than 6,000 jobs<sup>11</sup>. We have utilized USDA and Census data and the IMPLAN input-output modeling system to analyze the linkage between current and recommended fruit/vegetable consumption and the economic development potential of a shift that incorporates locally grown to the extent currently feasible.

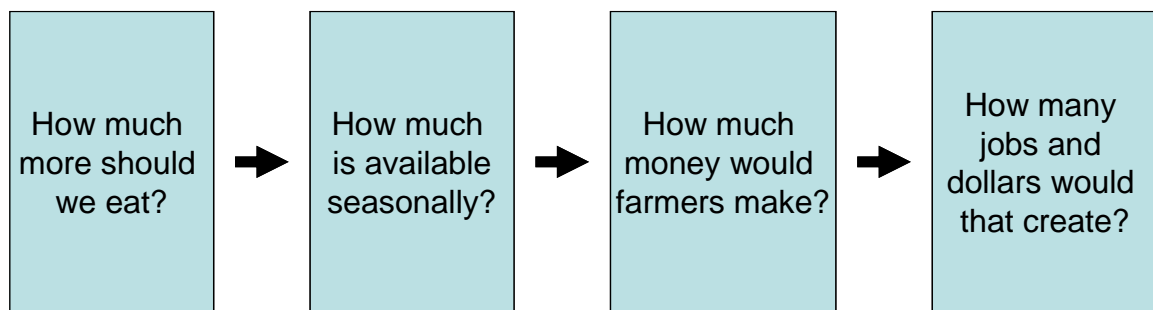
### **Methods and Results**

This study utilizes several national and state data sources: USDA Economic Research Service (ERS) the National Agriculture Statistics Service (NASS), the U.S. Census Bureau, and Michigan State University Extension data on seasonal availability of various crops. The sequential methodology is as follows and is analyzed with respect to the population of Michigan (see Figure 1)

- How many servings of fruits and vegetables *should* we consume (according to USDA My Pyramid guidelines)? How many servings of fruits and vegetables *do* we currently consume? What is the overall consumption gap?
- Of those currently consumed, which fruits and vegetable items are grown in Michigan and how many days per year is each available fresh?

- Assuming a proportional increase consumption of all fruits and vegetables to meet My Pyramid guidelines; sourced from Michigan as available, what tonnage of additional fruits and vegetables would be needed? How much additional income would farmers generate?
- How many acres would be needed to grow these quantities? What is the net gain to farmers from changing these acres from field crops to fresh produce?
- When this net income is multiplied though the overall economy, how many jobs and how much net income would it generate?

Figure 1. . Basic Steps of the Analysis



The analysis below provides detail on the calculation and data sources utilized.

What we should and do eat We first calculated the number of fruit and vegetable servings that Michigan residents should eat; beginning with USDA recommendations (cups per day)<sup>12</sup>. Serving recommendations are based on caloric intake which in turn are based on sex, age and activity level. We assumed that 33 % of Michigan residents of all ages are “active” and 67% are “sedentary” for purposes of estimation. “Active” is defined as “a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at

3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life”<sup>12</sup>. Alternative scenarios with 10 % or 25% active were tested and we found the overall analysis changed by 5% and 15% respectively. In our analysis children 0-1 years of age are assumed to require one-half the servings of 2-3 years olds. 2004 US Census data for Michigan’s population by age and sex were utilized<sup>13</sup>. Recommended servings for each age-sex-activity grouping were determined, yearly needs calculated and summed across the state’s population. Michigan’s 10.1 million residents were determined to need 6,757,371,898 servings of fruit and 9,819,558,926 servings of vegetables annually.

2004 data on US per capita consumption (servings per day) of various fruits and vegetables in various forms (e.g., fresh, frozen, canned, etc.) were utilized as a basis for determining what and how much Michigan residents currently consume<sup>14</sup>. The average per capita consumption of fruit (0.85 servings/day) and for vegetables (1.49 vegetable servings /day excluding potato chips and shoestrings). Applying this to Michigan’s population indicates that Michigan residents annually eat 3,138,352,359 servings of fruit and 5,490,561,712 servings of vegetables. Therefore, Michigan residents need to eat 2.15 times more fruit and 1.79 times more vegetables to meet Pyramid recommendations (Equation 1), which we heretofore call the Target Ratio (TR). Table 1 details the calculations used..

Table 1. Overview of Calculations

Equation Number	Equation	Definitions
1	$Q_s/Q_d=TR$	Q=quantity consumed; s=should eat; d=do eat  TR=Target Ratio; i=individual (per capita)
2	$Q_{ci}*TR=Q_{ti}$	t=target
3	$Q_{ti}-Q_{ci}=Q\Delta i$	Pop=Michigan Population; c=current; t=target; $\Delta$ =change;
4	$Q\Delta i*Pop= Q\Delta m$	m=Michigan
5	$Q\Delta m*AY=Q_{nm}$	AY=Available Year; n=new
6	$Q_{nm}*P=R_{nm}$	Q= quantity consumed (pounds per year);  P=price (\$/lb); R=revenue (\$)

Local availability and change in consumption We next modeled the extent to which this increase could come from Michigan grown produce without extensive changes in currently used technologies (for example high tunnel based season extension strategies). For simplicity, we assumed that individuals would increase their consumption of each item proportionate to current consumption patterns, i.e. that only quantity within each



fruit/vegetable would change. We also only modeled that portion of increased consumption that would come from fresh produce. We assumed that there is no change in the places people buy what they consume. However, we do assume change with respect to production location; that is, we assume that all increases in consumption of fresh produce items that can be grown in Michigan are consumed from those produced in Michigan. For example, we assume people will eat by 2.15 times more fresh apples than they do now, thereby meeting the consumption target and that those fresh apples making up the increase in consumption will come from Michigan during those times when they are available.

Furthermore, given that Michigan is seasonally challenged and has a fairly limited growing season, it is not possible to eat a broad array of locally grown fresh produce year round (independent of widespread adoption of season extension technology and post-harvest management and storage); we determined approximately how many days per year each item that can be grown in Michigan is available. The USDA ERS data include 32 fresh vegetables, all but one of which (artichokes) can be grown in Michigan; in contrast only 11 of the 24 fresh fruits tracked by ERS can be grown in Michigan. To determine available days for each item, we used a Michigan availability guide developed by Michigan State University Extension<sup>15</sup>, and calculated the percent year each is available fresh. For those items not specifically listed in the Guide, the most analogous vegetable is used (e.g., snap beans for lima beans) or best estimates (okra, garlic and sweet potatoes) were developed.

To calculate the projected change in consumption of Michigan produce for each fruit and vegetable, we calculated the individual target quantity (Equation 2); the target consumption/current consumption differential per person (Equation 3); the statewide differential quantity (Equation 4); and finally the quantity that could derive from Michigan taking account of seasonality (Equation 5). We project an aggregate of 145,886,255 new Michigan pounds of fruit and 538,525,149 pounds of vegetables.

Prices and gross revenue Prices are all expressed in dollars per pound and are derived primarily from the USDA NASS, Michigan Field Office's rotational survey of vegetables<sup>16</sup>. Those not available from NASS were obtained from USDA reports of prices at the Detroit Terminal Market in August, 2006<sup>17</sup>. When multiple prices were listed, the lowest price was used to insure conservative final estimates. Similarly for fruit the majority of prices came from NASS<sup>18</sup> while the remainder came from USDA<sup>19</sup>. Total new gross revenues were calculated (Equation 6). The annual gross revenues for fruit and vegetables in our scenario are \$31,738,965 and \$134,384,606 respectively.

Acres and opportunity cost Finally, we assume that the additional production of fruits and vegetables come from existing agricultural acreage. We assume that acreage comes equally from the following four crops: dry beans, corn, soybeans and wheat. The mean revenue for these crops is \$248/acre.

To determine the acreage requirements for new fruit and vegetable production we determined yields per acre from various sources<sup>18, 20-22</sup> and multiplied by projected new production pounds. We find 10,209 fruit acres and 27,244 vegetable acres, equaling

37,453 total acres, are needed. The lost revenue from taking existing crops out of production (see above) for these acres is subtracted from gross revenue to measure net revenue, totaling \$29,202,383 for fruit and \$127,615,512 for vegetables. Mean acreage for Michigan fruit and fresh vegetable farms are 56 acres and 44 acres respectively; therefore if this production came from new farms it would require 182 fruit and 619 vegetable farms of average size.

#### Economic Impact: Results from IMPLAN

IMPLAN was utilized to model the impacts of these increase farm gate net revenues on net job creation within Michigan. IMPLAN is one of the two standard Input-Output models that attempt to quantify the economic impacts of new or the expansion of existing industries.

In our analysis, the changes discussed above would result in a net of increase of 1,780 jobs and a total net increase of \$211 million in income within the state. Increased sales in fruit would result in 529 jobs and \$42.4 million in income; vegetables sales account for 1,251 jobs and \$169.1 million.

#### **Discussion**

This study attempts to develop an analytical framework for realistically investigating the following ‘what if’: What if residents of an area increased their fruit and vegetable consumption to recommended levels with increased consumption of seasonal, locally grown fresh produce when possible?

Identifying the local and regional economic development potential of ‘relocalizing’ our food supply is a strategy that is beginning to percolate throughout the ‘local food

movement' as a means to both enlist a broader array of actors and as a tool for generating resources in this effort. However, this is the first study of which we are aware that has conducted this analysis within a defensible public health related context. One aforementioned study <sup>11</sup> investigated increasing consumption to public health standards and sourcing locally; however it used flat percentages from local sources rather than an analysis of current consumption habits and production potential. Thus, a number of additional assumptions were embedded in their analysis. Others <sup>23</sup> have investigated the economic potential through analysis of Bureau of Labor Statistics and other data and their relation to production data in the region of consideration, ignoring, among other issues, the opportunity cost of production shifts.

It is useful for us to consider the linkage between these data and the opportunity to operationalize this in communities across the locale, in this case Michigan. It is clear that relatively small changes in individual eating habits across a state's population (on average a doubling of fruit and vegetable consumption) can have significant direct and indirect impacts upon employment and income. In a sense, this is a conservative estimate of impacts as it does not account for economic benefit resulting from increased productivity and decreased health care costs resulting from improved nutrition and health. This analysis does not factor increases in population or activity, both of which would also result in larger economic impacts. Michigan's population is growing slowly, and measuring the impacts of activity, while important, is beyond the scope of this study.

And yet, literature across the field of nutrition education illustrates that fostering such a change in eating and purchasing habits is no small task. It was our intent to pose and answer this as a ‘what if’ question, to demonstrate the potential of the food system as an economic driver, in order, in part, to determine if garnering the kind of broad support - from government, industry, academia, non-profit agencies, and other stakeholders – needed to usher in such a change is warranted. In the best case such research is linked to efforts on the state, regional and community level, to increase and coordinate demand and availability of locally grown foods; in essence developing a social and physical environment that is conducive to healthy food behavior. These efforts recognize the need to both develop direct markets such as farmers markets and greater availability of local foods in mainstream outlets like supermarkets and food service. Articulating the broad benefits of local food purchases may also form the bases of product differentiation strategies which will help buffer local producers from lower priced imported goods.

In Michigan the last several years have seen the emergence of a number of activities, focused at different levels of engagement, that provide an opportunity to translate such data into collaborative practice and consequently just such a conducive environment. These include the Michigan State Food Policy Council (state), Food System Economic Partnership (regional) and Sault Sainte Marie Farmers Market (community). Key factors in the formation and success of each group includes emphasis upon opportunity at the intersection of food, nutrition and economics.

The Michigan Food Policy Council<sup>24</sup> was established by Michigan Governor Jennifer Granholm in 2005; in October 2006, the Council presented Governor Granholm with a set of 20 policy recommendations which “cover all aspects of the state's food system from field to fork, including growing the agri-food economy, accessing fresh and healthy foods, promoting Michigan foods and cultivating agricultural viability.”<sup>1</sup> Each recommendation includes a policy statement, explanation and list of implementation strategies. Several of these recommendations are consistent with the data developed in this study. For example, expansion of the Select Michigan food promotion program would help consumers identify Michigan grown foods in grocery stores.

On the regional level, several efforts in Michigan are working toward creating, identifying and acting upon opportunities for local food systems, including efforts by the Michigan Land Use Institute in northwest lower Michigan and the West Michigan Forum for Sustainable Agriculture based in Grand Rapids. One project that has attracted a particularly diverse set of participants is the Food System Economic Partnership (FSEP) of southeast Michigan<sup>25</sup>. FSEP's leadership teams includes representatives of five county governments; farm business and commodity groups like the state Farm Bureau, the Farmers Union, sheep breeders and organic farmers organizations; various food businesses; and community activists. FSEP works to identify opportunity for rural-urban linkages. While primarily focusing on economic opportunity, they acknowledge regional problems with diet related illness and unhealthy urban environments. One program which particularly contributes to our scenario to increase fruit and vegetable consumption is the Farm to School project: “the specific purpose of the Farm to School Program is to

increase the amount of local farm foods in schools and improve the health and education of children and their families regarding the food system.”

Perhaps the best example of the integration of food, agriculture and economy takes place on the local level at the Sault Sainte Marie Farmers market in the eastern Upper Peninsula (EUP) of Michigan. According the market founder, MSUE Chippewa County Director Jim Lucas finding fresh healthy food in the EUP has long been a difficult task. Lucas began the market by asking a local farm family to sponsor a Project FRESH market on Wednesday afternoons following nutrition education lessons for WIC families. As Lucas recalls, “The idea would be they would learn about the value of fresh fruits and vegetables, receive their Project FRESH coupons, walk out the door and shop!” In 2005, it became the second farmers’ market in Michigan to offer EBT purchases. Senior Project FRESH was added in 2006. By 2007, the market featured 40 vendors and between 400-500 customers spending about \$4,000 each week (J.Lucas, [lucasj@msu.edu], email communication with David Conner, October 1, 2007).

According to a study of the market in August 2007<sup>26</sup>, the market has become more than a site of nutrition education and access to local foods: it is a vital factor in revitalizing a struggling downtown area and an important social meeting spot. In a focus group with market shoppers, most participants stated that they attend the market every week and buy most or all of their produce, fish and meat there. They value the foods’ freshness and high quality and supporting local farmers; they are willing to pay a premium. Finally, they believe the market brings people downtown where they support other local businesses. In

2008, with a partnership with the downtown development authority, the market is moving to a new location where it will serve as a hub for the historic downtown, tourist and museum districts. Clearly, Lucas has used food and agriculture to create opportunity for broader community economic development.

These efforts, like many in Michigan, are relatively new with impacts to date that are difficult to measure. But by engaging a broad set of stakeholders in the public and private sectors, they create opportunities for increased availability and consumption of local foods and thereby advance the types of economic gains predicted by our study while developing a context for improved dietary habits.

## **Conclusions**

As scholars at a public university in Michigan, we feel profound responsibility to address the chronic issues in our state: we believe that efforts at the intersection food and agriculture, nutrition and health, and economics have great potential to revitalize Michigan and generate broadly applicable lessons for many other areas. We further believe that studies addressing the economic impacts of “what if” scenarios will be useful in garnering broad support from diverse stakeholders and creating constituencies for far reaching efforts to improve citizen’s well-being. The job and income impacts of this scenario – almost 1,800 jobs and more than \$200 million in income- demonstrate the potential of the food system as an economic driver at a time when Michigan is experiencing great economic distress. Finally, we again acknowledge that fostering a statewide shift in eating and buying habits is no trivial task. A shift in eating habits to



more local and healthy alternatives will require greater access of these foods in more commonly used outlets (supermarkets, as well as restaurants and institutions). Greater use of season extension technologies is also a critical piece that could expand the impact cited here.

We believe that many state, regional and community efforts to create a more sustainable food system are underway here and in many other places; furthermore, we believe that posing and answering ‘what if’ questions, as part of a larger strategy to articulate the economic development opportunities of food systems, has great potential to attract the broad constituencies needed to continue this transformation. We hope to continue to both learn and share lessons and strategies in the future.

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