The Journal of
Regional
Analysis
& Policy

Special Section: Tourism and Regional Science JRAP 37(3):213-222.

Impacts of Organic Food Agritourism on a Small Rural Economy: A Social Accounting Matrix Approach

Yuri Mansury and Tadayuki Hara
KDI School of Public Policy and Management - Republic of Korea
and University of Central Florida - USA

Abstract. The U.S. organic food market recently experienced a rapid expansion, and yet this industry's potential to promote economic development remains largely unexplored. This paper proposes the introduction of organic-food agritourism as a sustainable development strategy for a distressed rural community. In contrast to conventional impact studies that emphasize final demand shocks, this study examines the impact of higher regional purchase coefficients (RPCs) based on the hypothesis that agritourism promotion will attract nature-oriented tourists inclined to spend more on organic produce. Using a social accounting matrix (SAM) model, we found that a successful campaign to promote organic agriculture not only is expected to deliver higher production output, but also generates a more egalitarian distribution of income.

1. Background

This paper examines the strategy of strengthening the link between tourism and agriculture (hence 'agritourism') to promote growth in a distressed rural economy. Agritourism includes all activities that connect visitors with the heritage, natural resource, or culinary experiences unique to the local agricultural industry (Wilson et al., 2006). This type of recreational activity offers the experience of being in a real agricultural environment through harvest-related festivals, farm stays, and farmers' markets. Increasingly, agritourism has relied on organic farming to attract nature-oriented travelers. At the same time, organic food itself has exhibited tremendous growth potential: demand has doubled in the last four years, and is expected to double again in the next 5 years (Datamonitor, 2004).

While growth remains a top policy objective, in recent years concerns have gradually shifted towards regional disparities and the uneven distribution of wealth and income (Armstrong and Taylor, 2000). The main impetus is the widening gap between the rich and the poor in the U.S. since the 1970s, which results in the share of the top wage earners now being higher than the pre World-War II level (Piketty and Saez, 2003). At the same time, the evidence suggest that high-growth, skill-intensive sectors tend to favor the educated workers already at the top of the income distribution, hence aggravating the initial inequality (Katz and Murphy, 1992).

General tourism was initially thought of as an industry capable of promoting both growth and equity because of its intensive use of local inputs and unskilled labor. It was later discovered, however, that the inability of the local community to fully participate in tourism activities results in a highly-unequal distribution of the gains (Zhenhua Liu, 2003). This potential conflict can be minimized if all stakeholders are made aware of the potential impact of tourism promotion on their income levels and employment status. Thus, a critical challenge faced by regional scientists is to inform community planners and concerned citizens alike not only the economic viability of a pro-growth strategy, but also the consequences on those with limited power and resources. Studies have shown that the more widely information is disseminated; the

more likely an optimal policy for the entire community will be adopted (Deller and Shields, 1998).

This study employs the region-wide framework of Social Accounting Matrix (SAM) analysis to examine the economic impact of agritourism promotion. Such a framework provides local policymakers a comprehensive view of a region's capacity to generate output as well as to create employment opportunities, which is a major concern for stagnating economies. The advantages of a region-wide approach for tourism planning have been detailed elsewhere (see, e.g., Fletcher, 1989). This study highlights the main advantage of a SAM to reconcile input-output accounts, which reflect production structure, and household accounts, which reflect social structure, hence is suitable for a *simultaneous* analysis of both output and income distribution.

The novelty of this study is the recognition that agritourism promotion leads to higher likelihood for tourists to spend on local organic produce. Within the SAM framework, this increase in local-content utilization is effectively captured by higher regional purchase coefficients (RPCs). To investigate the impact of higher RPCs, we choose a rural economy in Upstate New York known as the Liberty Trade Area that comprises the Town of Liberty at the core and other nearby villages. Liberty is situated within Sullivan County and has been classified by a New York State report (Eberts and Merschrod, 2000) as a "Rural Periphery."[1] Selected socioeconomic indicators for Liberty, New York (NY) State and the U.S are compared in Table 1.

A striking evidence of sluggish growth is found in the average annual wage of $28,725 in 2002 that was 40-percent lower than the NY State average.[2] Stagnating wages in turn led to the concentration of households in the lower income brackets, with about 60 percent earning less than $40,000 of annual income. This marginal living standard is accompanied by a lack of educational attainment and employment opportunities. Only 15.95 percent of the Liberty's population 25 years and over have bachelor's degree, significantly lower than the NY State and U.S. averages of 27.4 and 24.4 percent, respectively. At the same time, the unemployment rate of 9.87 percent was more than twice the NY State and U.S. averages.

Faced with the bleak prospects, local stakeholders have actively sought new ways to rejuvenate the Liberty economy. In 2003, the village community launched the Liberty Economic Action Project (LEAP), which seeks to expand local economic activity and employment opportunities. Based on local consensus, the LEAP Planning Team has identified agritourism as an inclusionary source of sustained economic growth capable of promoting an equitable distribution of growth.

A combination of nation-wide trend and location-specific factors supports the community's vision. Nation-wide, growing demand has continued to fuel the rapid expansion of the organic food industry (Dimitri and Greene, 2002). Geographically, the proximity to a large market (NY City) provides opportunities to Liberty's agriculture suppliers since fresh organic produce must be delivered to the consumers expeditiously. In addition, marketing data suggest that visitors typically belong to the 34-54 age group, unmarried, and work as business professionals.[3] These high-earning households have been identified to be the group most willing to pay the premium for organic produce (Govidnasamy and Italia, 1999).

It is important to note that Liberty's residents have expressed a clear preference for a balanced development characterized by both growth and equity. The latter ensures broad participation from all groups within the local community; otherwise the effort in all likelihood will not be sustainable. Indeed, across NY State income disparities have increasingly become a major policy concern due to persistent inequality that ranked the highest in the nation in the last two decades (Lynch, 2003). Thus, despite its growth potential, the impact of agritourism needs to be scrutinized within a framework that also explicitly considers the distribution of income.

The rest of this manuscript proceeds as follows. The following section details our modeling framework, while section 3 examines the social accounting data for Liberty. The simulation results are presented in section 4, and we close in section 5 with concluding remarks.

2. Social Accounting Matrix Framework

A SAM is designed to organize a complex interdependent network within a consistent, comprehensive, disaggregated, and complete framework (Thorbecke, 1998). An aggregated SAM data system that organizes transactions into two mutually-exclusive groups, namely the group of $N - k$ endogenous accounts and the group of k exogenous accounts is specified in Table 2. The former include those of activities, production factors, and households, while the latter the government, inventory, and export transactions.

[1] This type of counties has no central places with population greater than 9,500, commuting rates lower than 35 percent, and about 80 percent of the population lives in small communities of less than 2,500 people.

[2] Data from the Bureau of Labor Statistics, http://www.bls.gov.

[3] Personal communication with Sullivan County Visitors' Association.

Table 1. Selected socioeconomic indicators: Liberty Trade Area, New York State, and the United States, 2000 (Source: US Census Bureau 2006).

	Liberty Trade Area	New York State	United States
Population density (people per sq. mile)	59.91	401.84	79.58
Per capita income ($)	18,526	23,389	21,587
Unemployment rate (%)	9.87	4.3	3.7
Poverty rate (%)	14.75	14.6	12.4
% with bachelor's degree	15.95	27.4	24.4
% 65-yr old and over	15.68	12.9	12.4
% with social security income	33.96	26	25.7

Let $p = 1, 2, \ldots, P$; $f = 1, 2, \ldots, F$; and $h = 1, 2, \ldots, H$ index production, factors, and households, respectively. Let $i = j = 1, 2, \ldots, N - k$ index the entire set of endogenous accounts, hence $N - k = P + F + H$. In a typical approach of Pyatt and Round (1979), Table 2 partitions the endogenous transactions in SAM into 9 submatrices. For example, the submatrix Z_{pp} represents input-output transactions, while Z_{hf} captures the distribution of value-added across household groups.

The SAM data system can be transformed into a simple model for impact analysis under a set of well-known assumptions, such as constant prices, Leontief's production function, and perfectly-elastic supply. To build a SAM model, the first step entails the construction of the matrix of SAM coefficients $A = [\,a_{ij}\,]$, where $a_{ij} = z_{ij} / Y_j$, and Y_j is the total output of sector j. To measure the regional economy's response to an exogenous change, the matrix of SAM multipliers, M, is computed using the following well-known formula:

$$M = [I - A]^{-1} \qquad (1)$$

2.1 The Agritourism Sector

Before we can estimate the regional impact of agritourism promotion, two important components need to be specified. The first one is the final demand vector Y for tourism, while the second is the extent to which the existing regional purchase coefficients (RPCs) were adjusted to reflect the stronger linkages with organic-food producers. This section discusses the former, while modification of the RPCs is the subject of the next section.

Table 2. Typical organization of a SAM data system.

	Endogenous Accounts			**Exogenous**	**Totals**
	Production ($p = 1,\ldots,P$)	Factors ($f = 1,\ldots,F$)	Households ($h = 1,\ldots,H$)	Other Accounts	
Production (p)	Z_{pp}	0	Z_{ph}	X_p	Y_p
Factors (f)	Z_{fp}	0	0	X_f	Y_f
Households (h)	0	Z_{hf}	Z_{hh}	X_h	Y_h
Other Accounts	T_p	T_f	T_h	T_x	Y_x
Totals	Y_p	Y_f	Y_h	Y_x	

We utilize Sullivan County data provided by the New York State Council of Tourism Promotion Agencies as a proxy for the final demand column vector corresponding to the typical Liberty's visitors. This tourism data are based on the figures supplied by the New York State Department of Taxation and Finance. We present this final-demand column vector for Sullivan County in Table 3, which shows that the typical tourists spend about 16 percent of their tourism budget on lodgings, 29 percent on food and beverages, 17 percent on recreation and entertainment, and 23 percent on shopping. In Liberty the impact of transportation is minimal (about 8 percent of total tourism expenditures) since most visitors drive their own cars, which allows us to concentrate on lodgings, food services and drinking places as the main agritourism activities.

Table 3. Tourism-related expenditures in Sullivan County (New York State), 2002 (Source: New York State Council of Tourism Promotion Agencies).

Industry	Tourism-Related Expenditures ($)	% of Total
Traveler accommodations	37,030,447	16.36
Transportation	17,457,211	7.71
Food services and drinking places	66,125,798	29.21
Recreation and entertainment	39,675,479	17.52
Shopping	52,900,639	23.36
Miscellaneous	13,225,160	5.84
Total	226,414,733	100.00

2.2 Regional Purchase Coefficients

In this section, we demonstrate that the higher the percentage of money that remains in the local economy as reflected by higher RPCs, then the greater the multiplier impact will be. Let R_{ij} denote industry j's expenditure on imported commodity i. The *regional purchase coefficient* (RPC) for commodity i is defined as the proportion of local demand for that commodity, Z_{ij}, that is satisfied by local production (Miller and Blair, 1985). For example, an RPC of 0.7 for 'poultry' means that 70 percent of total demand for poultry is met by local production. Let r_{ij} denote the proportion spent on imported input i per dollar's worth of output j, $r_{ij} = R_{ij} / Y_j$, and consider industry j's total expenditures on input i, $T_{ij} = Z_{ij} + R_{ij}$. Thus, by construction, the SAM coefficient is $a_{ij} = t_{ij} - r_{ij}$, where $t_{ij} = T_{ij} / Y_j$. Then, other things equal, lower proportion of imports in industry j's input mix implies *stronger linkages* to the local economy:

$$RPC_i = \sum_j^N (t_{ij} - r_{ij}) Y_j / \sum_j^N t_{ij} \cdot Y_j \cdot \qquad (2)$$

Equation (2) shows that by reducing imports (lowering the r_{ij}'s), the RPC will rise, and in the limit tend to unity as would be the case if imports were completely eliminated.

The main interest of this paper is to investigate the scenario in which a successful promotion of local agritourism results in stronger interdependence between tourism and agricultural activities. We assume that a successful promotion leads to greater use of local agriculture, while simultaneously lesser use of imported inputs. The next step provides a theoretical framework to examine the impact of such an increase in local-content utilization as would be reflected in higher RPCs.[4]

With respect to a generalized statement regarding RPC's, we forward Theorem 1. Namely, this states that higher RPC's will lead to greater SAM multiplier

[4] In other words, holding constant the final demand vector, we observe how the impact would differ if organic food agritourism are promoted in Liberty.

values (a proof of which can be found in Appendix A). That is, in a SAM framework higher RPCs will always lead to greater multiplier impact. Intuitively, the region that minimizes the amount of money leaving the local economy via import leakages will have more of the initial injections left to circulate.

3. Data

The 2002 IMPLAN (Minnesota IMPLAN Group, Inc.) social accounting database for the Liberty Trade Area provides the starting point for our impact analysis. The database was designed to reveal the rich structural detail of the Liberty economy using matrix accounting device. IMPLAN constructed the SAM by identifying the Liberty zipcodes, and then aggregating the zipcode-level data obtained from the Census Bureau's County Business Patterns survey.[5] An additional procedure was applied to estimate agricultural output, using a combination of the Bureau of Economic Analysis' Benchmark Input-Output study, Census of Agriculture, and the National Agricultural Statistical Service data.

In this study, we aggregate the original 528 IMPLAN sectors into 29 sectors in a way that allows us to focus on the link between agritourism activities and income distribution. The IMPLAN household classification recognizes nine household groups based on their income levels; ranging from poor households that earned less than $10,000 to those earning more than $150,000 in the highest income bracket. An aggregated SAM for Liberty is presented in Table 4 that follows the classification scheme in Table 2.

3.1 Household Income Distribution

The SAM reveals that the lowest-income households in Liberty rely heavily on the drawing down of their savings. Specifically, the poorest group (HH LT10k) derived about 69 percent of their income from their savings, while the next group (HH 10-15k) derived more than 13 percent of their income from savings. No other household groups utilized savings as a source of income. In addition, the poorest households are less likely to own physical assets (such as housing), deriving less than 2 percent of their receipts from Other Property Income, significantly less than the average of 8.14 percent for all households. The poorest households are also less likely to own businesses as reflected in their 1.2 percent share of Proprietary Income.

The Liberty SAM also reveals that the lowest-income group was not the largest recipient of government transfers programs in 1999. Instead, HH 15-25k was the largest beneficiary receiving more than $45 million of government transfers, which represents 51.66 percent of these households' total income. The next largest beneficiary was HH 25-35k, which received about $41.9 million representing 43.75 percent of their total income. Thus, it appears that public assistance programs in the form of government transfers had not targeted the most vulnerable households. In light of this finding, it is of interests to examine whether agritourism is compatible with poverty alleviation and hence with a more equal distribution of income.

3.2 Estimates of RPCs for Liberty

Original data sources used for the construction of an IMPLAN SAM typically do not breakdown commodity supplies by region of origin. As a result, one has to rely on estimates of RPCs in order to distinguish between local production and imports. IMPLAN derives the RPCs for its SAM data system from econometric estimates by first making the distinction between foreign imports R_{ij}^{FOR} and imports from other U.S. regions R_{ij}^{US} such that:

$$R_{ij}^{US} = R_{ij} - R_{ij}^{FOR}, \qquad (4)$$

which allows **Equation (2)** for the RPC of sector i to be re-expressed the following way:

$$RPC_i = \frac{1}{1 + k_i^{FOR} + k_i^{US}}, \qquad (5)$$

where $k_i^{FOR} = \sum_j R_{ij}^{FOR} / Z_{ij}$ and $k_i^{US} = \sum_j R_{ij}^{US} / Z_{ij}$.

The proportion of locally-produced agritourism commodities in total input costs for the three hospitality sectors under the 'Original' columns is shown below in Section 4.1. As can be seen, in 2002 the lodgings industry in Liberty spent less than 0.005 percent of their total expenditures on local agriculture, indicating a very weak link. Other accommodation activities

[5] The Liberty zipcodes include the Town of Liberty (12754), Ferndale (12734), Parksville (12768), Swan Lake (12783), and White Sulphur Springs (12787). Bethel Town includes Bethel (12720), Kauneonga Lake (12749), White Lake (12786), and Smallwood (12778). Callicoon Town consists of Callicoon Center (12724), Jeffersonville (12748), and Youngsville (12791). Neversink Town includes Neversink (12765) and Grahamsville (12740), while Rockland Town comprises Livingston Manor (12758) and Roscoe (12776). Finally, Fallsburg is represented by Hurleyville (12747), Loch Sheldrake (12759), and Woodbourne (12788).

Table 4. Highly-aggregated SAM for the Liberty Trade Area, 2002 (in Millions of Dollars. Source: 2002 IMPLAN data)

	(1)	(2a)	(2b)	(2c)	(3a)	(3b)	(3c)	(4a)	(4b)	(4c)	(4d)	(4e)	(4f)
Industry total (1)	146.7	0.0	0.0	0.0	414.4	0.0	32.2	0.0	10.8	172.5	0.3	29.4	59.0
Employee compensation (2a)	306.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proprietary income (2b)	47.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other property income (2c)	145.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Households (3a)	0.0	266.1	46.0	64.1	17.1	32.2	30.8	0.0	163.1	32.0	0.0	0.3	136.4
Enterprises (3b)	0.0	0.0	0.0	41.4	0.0	0.0	5.5	0.0	1.9	0.1	0.0	0.0	0.0
Savings institutions (3c)	0.0	0.0	0.0	63.6	55.7	0.0	0.0	0.0	1.2	45.2	0.0	20.8	225.4
Indirect business taxes (4a)	39.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Federal government (4b)	0.0	39.6	1.8	0.0	1.7	7.1	309.7	3.6	21.3	0.0	0.0	0.2	0.5
State/local government (4c)	21.2	1.1	0.0	0.2	36.5	9.5	23.7	35.4	163.6	109.4	0.0	0.1	1.0
Inventory additions/deletions (4d)	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Foreign import (4e)	15.6	0.0	0.0	0.0	23.6	0.0	1.4	0.0	5.6	4.6	0.0	0.0	0.0
Import from other US regions (4f)	141.9	0.0	0.0	-23.7	239.2	0.0	8.2	0.0	18.5	38.0	0.2	0.0	0.0
Total	864.7	306.8	47.8	145.6	788.1	48.8	411.8	39.0	385.9	401.7	0.5	50.9	422.3

Table 5. Share of agricultural commodities and imports in tourism sectors expenditures: Liberty Trade Area, 2002 (Source: based on 2002 IMPLAN data for Liberty Trade Area).

	% of total expenditures					
	Hotels & motels incl. casino hotels		Other accommodations		Food services & drinking places	
	Original	Agritourism	Original	Agritourism	Original	Agritourism
Crop farming	0.0001	1.00	0.0025	2.00	0.23	2.00
Cattle ranching and farming	0.0000	1.00	0.0004	2.00	0.01	2.00
Poultry and egg production	0.0000	1.00	0.0009	2.00	0.16	2.00
Other agriculture	0.0001	1.00	0.0046	2.00	0.34	2.00
Food processing	0.0041	1.00	0.2881	2.00	11.89	11.89
Poultry processing	0.0002	1.00	0.0315	2.00	1.83	2.00
Total	0.0046	6.00	0.3280	10.39	14.46	21.89
Foreign import	0.25	0.25	1.28	1.28	1.48	1.48
Import from other US regions	8.40	4.00	20.39	10.33	32.52	30.30

spent only a slightly higher proportion (0.3 percent) on local agriculture. The contribution of imports as a percentage of total inputs for the three tourism sectors in Liberty is also shown in Table 5. Among the three, food and drinking has the highest leakage rates, as it imported almost 33 percent of its input requirements.

We note that several studies found RPC estimates to be the main source of errors in the construction of an input-output/SAM data system (see, e.g., Ralston et al., 1986). Nonetheless, the robustness of RPC estimates used in IMPLAN data remains a controversial issue. Showing evidence to the contrary, the industry-specific study of Lazarus et al. (2002) concluded that RPC estimates impart a relatively minor source of errors.

4. Promoting Organic-Food Agritourism

We capture the policy impact of organic food agritourism promotion through the stronger backward linkages between the local hospitality (tourism) industries and the local agricultural activities. Let T be the set of tourism activities, T = {Hotels and Motels, Other Accommodations, and Food and Drinking Places}, while A the set of agriculture and agriculture processing sectors, A = {Crop Farming, Cattle Ranching, Other Agriculture, Food Production, and Poultry Production}.

The new levels of local-content utilization under the 'Agritourism' column are shown in Table 5, representing the 'benchmark' scenario in which the

link between local tourism and agriculture is strengthened such that $a'_{at} > a_{at}$, $a \in A$ and $t \in T$. The extent of the hypothesized increase in local-content utilization (and hence the RPCs) is determined based on two assumptions. First, we assume that local agriculture can substitute imports from other U.S. regions, but that foreign imports are non-substitutable inputs. Hence, every increase in local-content utilization (greater SAM coefficients a_{ij}'s) is exactly matched by a decrease of the same magnitude in the share of domestic imports (from other US regions). The original share of domestic imports thus represents an upper bound constraining the total increase in local-content utilization.

Second, if less than 0.0005 percent is spent on local agriculture originally ($a_{ij} < 0.000005$), then under 'Agritourism' scenario it is raised to 1.0 percent; if less than two percent originally but greater than 0.0005 percent ($0.02 < a_{ij} < 0.000005$), then it is raised to 2.0 percent under 'Agritourism'. Finally, if the original expenditure share of local agriculture was greater than or equal to two percent ($a_{ij} > 0.02$), then that share remains unchanged under 'Agritourism'.

We shall also consider the scenario in which the lowest-income group (HH LT10k) is expected to benefit the most relative to other households. This 'pro-equity' scenario is determined by identifying the tourism activity, $t \in T$, and agricultural sector, $a \in A$, whose combined RPC changes lead to an outcome that is most favorable to the lowest-income group.

4.1 Impact on Sectoral Output

The total output (i.e., total sales) for each industry is obtained from the multiplication of the matrix of multipliers and the vector of tourism final-demand expenditures (see Table 3). The first numerical column of Table 6 presents the percentage change in sectoral output as a result of higher RPCs under the scenario of agritourism promotion, while holding the final demand vector constant. Consistent with Theorem 1, all sectors experience an increase in output. The sectors that benefit the most, as expected, are the local agriculture activities whose RPCs have been increased. Specifically, the output of the Other Agriculture sector is estimated to increase by 363 percent, Crop Farming +242 percent, Poultry and Egg Production +232 percent, Poultry Processing +44 percent, and Food Processing +11 percent.

The main task of an economic impact study is to estimate the total effects of a change in final demand. In particular, a tourism impact study typically aims to examine the effect of visitor expenditures. To this end, the second numerical column of Table 6 presents sectoral output changes as a result of higher RPCs accompanied by a 10-percent increase in visitor expenditures. The result is an across-the-board increase in sectoral output by more than 10 percent.

Table 6. Impact of higher regional purchase coefficients (RPCs) on sectoral output.

		Impact on Output (% change)	
	Industry	Original tourism demand	10% increase in tourism demand
1	Crop farming	242.34	276.57
2	Cattle ranching & farming	126.53	149.18
3	Poultry & egg production	231.78	264.96
4	Other agriculture	362.73	409.00
5	Utility & construction	3.82	14.20
6	Food processing	11.04	22.14
7	Poultry processing	44.39	58.83
8	Other manufacturing	15.58	27.14
9	Wholesale trade	3.71	14.08
10	Other transport & warehouse	0.37	10.41
11	Transit & ground passenger transportation	0.02	10.02
12	Motor vehicle & parts dealers	1.69	11.86
13	Furniture & appliance stores	1.67	11.83
14	Building material & garden supply stores	1.70	11.87
15	Food & beverage stores	1.70	11.87
16	Health & personal care stores	1.67	11.84
17	Gasoline stations	0.38	10.42
18	General merchandise & clothing stores	0.18	10.19
19	Miscellaneous store retailers	0.12	10.13
20	Nonstore retailers	0.10	10.11
21	Other services	0.83	10.92
22	Education & other social services	1.65	11.82
23	Hotels & motels	0.08	10.09
24	Other accommodations	0.03	10.04
25	Food services & drinking places	0.12	10.14
26	Car maintainance	2.98	13.28
27	Personal services	1.52	11.67
28	Religious organizations	1.76	11.94
29	Private NGO	2.44	12.68

4.2 Impact on Income Distribution

The previous section emphasizes the impact of agritourism promotion on production activities. The main advantage of a SAM, however, is that it enables an examination of the resulting distribution of income. First, we note that household income can be computed as $\sum_i m_{h,i} \cdot Y_i = m_h \cdot Y$, where $m_h \in M$ denotes the one-by-N vector in the SAM multiplier matrix corresponding to household group h, and Y the N-by-one column vector of final demand. Thus for example, $m_{\text{HH LT 10K},restaurant}$ denotes the multiplier impact on the income of the lowest-income group (HH LT 10K) following a one-dollar injection into the restaurant sector. In the following, $m'_h \in M'$ distinguishes the new multipliers associated with higher RPC's from the originals, $m_h \in M$.

The first numerical column of Table 7 shows that under the 'benchmark' case (Scenario 1) which holds constant the demand for tourism, all household groups benefit from the promotion of agritourism, $\sum_i \left(m'_{ih} - m_{ih}\right) Y_i / \sum_i m_{ih} \cdot Y_i > 0$. However, the lowest-income households (earning less than $10,000 annually) stand to benefit the most with an estimated 2.57 percent increase in income. Therefore, stronger linkages between tourism activities and local agriculture alleviate poverty while at the same time reduce income inequality. It appears therefore that agritourism presents not only a viable strategy for economic development, but also promotes a more egalitarian distribution of income.

Table 7. Impact of higher regional purchase coefficients (RPCs) on household income.

	% Change in Per HH Income			
HH Group	Scenario 1	Scenario 2	Scenario 3	Scenario 4
HH LT10k	2.57	12.83	9.45	20.40
HH 10-15k	1.80	11.98	6.46	17.10
HH 15-25k	1.69	11.86	6.01	16.61
HH 25-35k	1.70	11.87	6.07	16.67
HH 35-50k	1.74	11.91	6.21	16.83
HH 50-75k	1.66	11.83	5.92	16.51
HH 75-100k	1.86	12.05	6.70	17.37
HH 100-150k	1.80	11.98	6.43	17.08
HH 150k+	1.74	11.91	6.18	16.80

On the surface, the gain in income appears to be marginal, ranging from 2.19 to 3.41 percent. These gains, however, must be interpreted as *solely* due to higher multiplier values brought about by higher RPCs between tourism activities and local agriculture. Ultimately, SAM multipliers are useful for the purpose of measuring the regional impact of an exogenous economic shock. With that in mind, consider next a hypothetical 10-percent increase in the demand for tourism output following a successful campaign to promote agriculture-oriented tourism activities. Under this scenario, every element of the tourism final demand vector (Table 3) increases by 10 percent. The resulting change in household income due to the *combination* of higher RPCs and higher tourism demand (Scenario 2) is shown in the second numerical column of Table 7. Again the lowest income group gains the most, but this time with a significant 12.83 percent increase in income.

We also found the tourism activity $t \in T$ and agricultural sector $a \in A$ (see Section 4.0 above) whose combined RPC changes lead to an outcome that is most favorable to the lowest-income group (HH LT10k). This outcome, which we call 'pro-equity', is captured in numerical columns 3 and 4 of Table 7. Specifically in Scenario 3, we found that maximizing RPC changes corresponding to Food Places and Crop Farming while holding the final demand constant generate a 9.45-percent increase in the income of the lowest-income group. If in addition tourism final demand expenditures are also increased by 10 percent as in Scenario 4, then the lowest-income group experience a 20.4-percent increase in income, which is on average 3.5 percent higher than for any other groups.

5. Concluding Remarks

Agritourism provides an alternative to conventional tourism as a vehicle to meet 'the goals of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987: 43). The SAM multipliers capture the extent to which households are expected to benefit from agritourism promotion in Liberty. This study, however, does not concern with higher income *per se* but with the distribution of income. It is of course possible for one group to improve in *absolute* terms, yet still loses ground in the income distribution, as would be the case when other groups experience even greater gain. The SAM results have demonstrated, however, that agritourism promotion benefits the lowest-income group proportionately more. As a result, the lowest-income group experiences an improvement in *relative* terms, consistent with a more egalitarian distribution of income.

Questions remain on the economic viability of an agriculture-oriented strategy. The empirical evidence, however, suggest that organic agriculture has generated consistently higher profits than traditional farming for at least two main reasons. First, successful product differentiation translates into price premiums, providing farmers higher profits than traditional produce (see, e.g., Klonsky and Livingston, 1994). In addition, organic agriculture also yields significantly higher revenues per unit hectare of land (see, e.g., Swezey et al., 1994). The source of higher revenues is the purchasing power of upper-middle class consumers who are willing to pay a premium for organic foods. The organic-food sector therefore provides stable financial inflows through a market that continues to expand into the foreseeable future.

Finally, it is important for tourism planners to recognize the limitations of the SAM approach. Underlying the SAM model are various simplifying assumptions, which include fixed prices, zero elasticity of substitution, and firm homogeneity. The last assump-

tion can be particularly problematic for rural agritourism in which firms of differing sizes, assets, and managerial capabilities are all lumped together into a single category. Tourism planners also need to be wary of the interpretation of the SAM multipliers, which has been discussed extensively elsewhere (see, e.g., Archer, 1984).

It is also important to recognize various assumptions underlying the IMPLAN data that can lead to the propagation of errors. In particular, those pertain to the IMPLAN estimates of the RPCs (see **Equation (5)**). Due to the lack of detailed international trade data, IMPLAN assumes k_i^{FOR} to be identical across all activities, $k_i^{FOR} = \bar{k}^{FOR}$ for all *i*, while the ratio k_i^{US} is econometrically estimated (see Minnesota IMPLAN Group, 2000). Another source of error is the various assumptions required to produce zip-code level SAM data. Zip-code level information is only available for employment based on the County Business Patterns program. IMPLAN then uses employment ratios to distribute aggregate county data to the desired zip-codes.

We note also that the accuracy of results from SAM-based impact analyses depend on the reliability of the tourism final demand vector, which ideally should be region specific. In this case, due to data unavailability we use the final demand vector for Sullivan County as a proxy. Since there are differences in consumption pattern as well as production structure between Sullivan County and Liberty, in the future an estimate of Liberty's tourism expenditures will be highly desirable. All these limitations suggest a future study that aims to find reliable estimates of (1) the true RPCs, (2) SAM accounts, and (3) tourism final demand for Liberty based on *primary* data.

References

Archer, B.H. 1984. Economic impact: Misleading multipliers. *Annals of Tourism Research* 11: 517-518.

Armstrong, H. and J. Taylor. 2000. *Regional Economics and Policy*. Third Edition. Oxford, UK: Blackwell Publishers.

Datamonitor. 2004. *Organic Food in the United States: Industry Profile*. New York, NY: Datamonitor.

Deller, S. and M. Shields. 1998. Economic impact modeling as a tool for community economic development. *Journal of Regional Analysis and Policy* 28(2): 76-95.

Dimitri, C. and C. Greene. 2002. *Recent Growth Patterns in the U.S. Organic Foods Market*. US Department of Agriculture (USDA) Agriculture Information Bulletin No. 777, September. <http://www.ers.usda.gov/publications/aib777>.

Eberts, P.R. and K. Merschrod. 2000. *Socioeconomic Trends and Well-Being Indicators in New York State, 1950-2000*. Albany, NY: New York State Legislative Commission on Rural Resources.

Fletcher, J.E. 1989. Input-output analysis and tourism impact studies. *Annals of Tourism Research* 16: 514-529.

Govidnasamy, R. and J. Italia. 1999. Predicting willingness to pay a premium for organically grown fresh produce. *Journal of Food Distribution Research* 30(2): 44-53.

Katz, L. F. and K.M. Murphy. 1992. Changes in relative wages, 1963-1987: supply and demand factors. *Quarterly Journal of Economics* 107 (1): 35-78.

Klonsky, K. and P. Livingston. 1994. Alternative systems aim to reduce inputs, maintain profits. *California Agriculture* 48 (5).

Lazarus, W., D.E. Platas, and G.W. Morse. 2002. IMPLAN's weakest link: production functions or regional purchase coefficients? *Journal of Regional Analysis and Policy* 32(1): 33-49.

Lynch, R.G. 2003. Estimates of income and income inequality in the United States and in each of the 50 States, 1988-1999. *Journal of Regional Science* 43(3): 571-587.

Miller, R.E. and P.D. Blair. 1985. *Input-Output Analysis: Foundations and Extensions*. Englewood Cliffs, NJ: Prentice Hall.

Minnesota IMPLAN Group. 2000. *IMPLAN Professional Version 2.0, Social Accounting & Impact Analysis Software: User's Guide, Analysis Guide, Data Guide*. Stillwater, MN.

Minnesota IMPLAN Group. 2002. IMPLAN System (data and software). Stillwater, MN.

Piketty, T. and E. Saez. 2003. Income inequality in the United States, 1913 – 1998. *Quarterly Journal of Economics* 118 (1): 1-39.

Pyatt, G. and J.I. Round. 1979. Accounting and fixed price multipliers in a social accounting matrix framework. *Economic Journal* 89: 850-873.

Ralston, D., S. Hastings, and S. Rucker. 1986. Improving regional I-O models: Evidence against uniform regional purchase coefficients across rows. *Annals of Regional Science* 25(4): 65-80.

Swezey, S., J. Rider, M. Werner, M. Buchanan, J. Allison, and S. Gliessman. 1994. Granny Smith conversions to organic show early success. *California Agriculture* 48.

Thorbecke, E. 1998. Social accounting matrices and social accounting analysis. In: W. Isard, I.J. Azis, M.P. Drennan, R.E. Miller, S. Saltzman, and E.

Thorbecke. (ed.) *Methods of Interregional and Regional Analysis*. Aldershot, UK: Ashgate.
U.S. Census Bureau 2006. American FactFinders http://factfinder.census.gov.
Wilson, J., D. Thilmany and M. Sullins. 2006. Agritourism: A potential economic driver in the Rural West. Economic Development Report No. EDR 06-01, Colorado State University Cooperative Extension. <http://dare.agsci.colostate.edu>
Zhenhua Liu, M. 2003. Sustainable tourism development: A critique. *Journal of Sustainable Tourism* 11(6): 459-475.

Appendix A. Proof of Theorem 1

Theorem 1 can be proved most easily using the approximation of the SAM multiplier matrix, $M = [I - A]^{-1}$, based on a power series expansion. First, consider the square matrix Δ having the same dimension as the matrix of SAM coefficient A. Assume that every element $\delta_{ij} \in \Delta$ satisfies two conditions: (a) $0 \le \delta_{ij} \le 1$ and, (b) $\sum_i^N \delta_{ij} \le 1 - \sum_i^N a_{ij}$. Condition (b) stipulates that the sum of every element belonging to the same column in the matrix Δ is bounded from above by the proportion of account j's expenditures spent on the exogenous accounts. Next consider the shifting of expenditures from imports to local production, resulting in a new matrix of SAM coefficients $A^* = A + \Delta$. Now, compute the new multiplier matrix $M^* = [I - A^*]^{-1}$ using the power series expansion:

$$M^* \approx I + A^* + A^{*2} + A^{*3} + \ldots + A^{*n-1} + A^{*n}. \qquad (3)$$

Since $0 \le a_{ij} \le a_{ij}^*$ for all $a_{ij} \in A$ and $a_{ij}^* \in A^*$, it follows that $m_{ij}^* \ge m_{ij}$ for every $m_{ij} \in M$ and $m_{ij}^* \in M^*$, with at least one strict inequality. This completes the proof. □