CSA 2001:

An Evolving Platform for Ecological and Economical Agricultural Marketing and Production

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Introduction

Community Supported Agriculture (CSA) is a constantly evolving approach to both farm production and marketing that connects farmers with consumers or shareholders. Shareholders purchase a share of product from the farm prior to the season, usually during the winter or early spring. With much of the marketing behind them, the farmer can then concentrate on production throughout the growing season. Typically, the growing season lasts from May through October, but some farms also provide winter crops. The principle behind CSA is straightforward. The consumers purchase shares prior to the start of production implicitly, or explicitly, accepting the potential risks of farming as well as rewards (Stern 1992; Karr 1993). The CSA concept brings together consumers and farmers with similar ideologies. CSA shareholders are typically interested in where their food comes from and how it is produced as well as in the progress and problems of agriculture (Cooley and Lass, 1998). Through CSA, the shareholders develop a stronger appreciation for farms and for the linkages between farms and the environment (Van En 1988; Lamb 1996). The CSA operator, writes Karr (1993), has a desire for the farm to be self-sufficient, vital, and a healthy part of the community. If there is a demand for fresh, locally grown, organic food in the community, CSA operators can encourage reliance on locally produced food rather than a dependence upon imported produce.

CSA farmers focus on product and market diversification, reducing chemical input use, introducing new food products and applying innovative marketing techniques. These farmers are trying to maintain their economic viability by mitigating various detrimental effects such as rising land prices caused by competing land uses and low prices for their product. The costs of production for organic farmers may not be covered due to fluctuating market prices and and relatively high costs of production, especially in terms of labor costs. Organic agriculture is also perceived to be more susceptible to pests due to inability to intervene with fertilizer and biocide applications. But, it is this higher degree of risk has led producers to seek a new social and economic basis for agriculture, namely CSA (Lamb 1996; Padel and Lampkin 1994).

CSA can benefit the producer by lowering direct marketing costs and, importantly, by spreading risk over all shareholders. In case of a crop failure, all shareholders rather than just the farmer absorb losses. Alternatively, the rewards from an outstanding crop year do not go only to the farmer but rather to all shareholders as well. The farmer's income is less dependent upon risks incurred during the production period, which improves his or her financial credibility. The up-front monies at the beginning of the growing season also reduce worries about future market price fluctuations. The farmer has the option of buying equipment and supplies without having to worry about loans and debt (Van En and Roth 1992; Karr 1993).

There are two objectives that we attempt to address with this research. The first objective was to extend previous research on the viability of CSA in the Northeast to a sample of CSA farms across the country. To achieve this objective, information regarding farm production, returns, cost of production, other income (both on and off-farm), and socio-demographic measures were collected through surveys sent to CSA farm operators. These data will be analyzed to assess the viability of CSAs using descriptive statistics. The summary measures will be compared to previous research results for the Northeast.

The information gathered from these surveys will also be used to address the second objective of the study, namely, to assess whether different farm characteristics can explain different measures of CSA financial success. To fulfill the second objective, multivariate relationships were developed based loosely on the neoclassical economic models of cost minimization and profit maximization. These models were used to estimate how various farm and demographic characteristics affect CSA operations and measures of viability or success.

CSA Survey Results

Mail surveys were conducted during the spring of 2002, following a more widely distributed mail survey designed to gather very basic information about CSA farms across the U.S. The data collect from this survey will be compared with survey data collected for the Northeast during the springs of 1996, 1997, and 1998. The Northeast surveys were sent to CSA operations in nine Northeastern states. There were 23 respondents from eight states (CT, MA, ME, NJ, NY, PA, RI, and VT) in 1995, 26 respondents from nine Northeastern states (CT, MA, ME, NH, NJ, NY, PA, RI, and VT) in 1996, and 33 from the same nine states in 1997. The 2002 asked for information for the 2001 crop year and was extended to include the entire contiguous United States. Fifty-nine responses were received, of which 25 belonged to the nine Northeastern states of the previous surveys.

These survey questionnaires were similar in that they included questions on characteristics of the CSA operation, types of CSA shares available, revenue from CSA shares, and other sources of income, both farm and off-farm. Questions were included on the number and type of products produced, the types of CSA shares sold, as well as questions about production decisions such as labor use and weed, soil, and disease management. The operator was asked to provide detailed farm expense data and personal questions asked of the operator included age, education, and years of farming experience.

Table 1 shows basic summary statistics of all participating CSA farms responding in each of the survey years. Total farm cropland on average was approximately 22.2 acres in 1995, 23.19 acres in 1997, 18.72 acres in 1997 and 16.88 acres in 2001. The average acres dedicated to CSA production show a similar trend; there was a slight change between 1995 and 1996 from about 12 acres to 11 acres. Acreage devoted to the CSA then declined to 7.6 acres in 1997 and 5.6 acres in 2001. While we make comparisons across time, we also need to remember that these data are not strictly comparable because of the different populations from which the samples were drawn.

CSA income is obtained primarily through the selling of shares to shareholders. Table 1 also shows the different share types offered to non-working members of the CSA farms that responded. The share figures of each farm were then used to determine an average equivalent number of full shares offered in each of the four years. To calculate the equivalent number of full shares (*full share equivalents*), full, half, and other shares were each weighted by their respective prices relative to the price of the farm's full share to produce the number of *full share*

Table 1. Farm Characteristics for the average CSA operation in 1995, 1996, 1997, & 2001				
	1995	**1996**	**1997**	**2001**
Total Cropland (acres)	22.20	23.19	18.72	16.88
CSA Cropland (acres)	11.96	10.79	7.59	5.59
CSA Share Price	*Average ($) / Share*			
Shares:				
Full	416.32	412.88	352.98	388.94
Half	243.75	247.00	273.35	253.96
Other	307.50	358.33	266.43	163.13
Number of Full Share Equivalents	75.09	77.29	92.04	88.00

equivalents this provides a more consistent measure of CSA farm output for comparisons. As seen in Table 1, the number of Northeast full share equivalents has increased over time. The results from the national survey for 2001 suggest that CSA farms are similar across the U.S., perhaps just a bit smaller. Prices for full and half shares for the sample of U.S. CSAs were also comparable to the summary measures obtained in the Northeast in previous years.

In each year, survey participants were asked to itemize CSA's production costs. The average reported farm expenditures by year are listed and compared in Appendix A. Cost data were available from 23 farms in 1995, 26 farms in 1996, 33 farms in 1997 and 78 farms in 2001. In order to estimate the total costs for the average CSA firm, the individual operating costs were summed. Average costs per share were determined by dividing the total average CSA inputs by the average number of full share equivalents (see Table 1). Table 2 summarizes CSA farm costs. Average total CSA farm costs reported across the four survey years were $32,038 ($426.66 per share) in 1995, $31,856 ($412.17 per share) in 1996, $23,884 ($259.50 per share) in 1997, and $23,262 ($264.34 per share) in 2001.

The largest contributing factor to CSA costs was labor. This was anticipated because CSA farms seek to produce organic produce without the assistance of pesticides or chemically enhanced fertilizers. Labor typically substitutes for these farm inputs in the production process. The next largest cost of production across survey years was depreciation of capital assets. It is assumed that depreciation is an accurate indication of capital replacement; detailed information on farm capital assets was not requested in the surveys. Some farms listed capital expenditures, such as a tractor or greenhouse, as part of their farms costs. This does not adequately reflect the cost of the items to shareholders, as capital asset costs are charged over the total life of the asset. Therefore, any capital expenditures listed were excluded from the average total cost calculations. The average cash expenses per farm were $30,674 ($409 per share) in 1995, $28,254 ($366 per share) in 1996, $23,362 ($254 per share), and $19,455 ($288 per share) in 2001.

CSA operators were asked to provide two measures of their CSA's revenue. The first measure was a dollar estimate of income by the respondent, the *reported* revenue. The second revenue estimate was calculated as the sum received from the sale of all shares to consumers. This *computed* revenue represents the CSAs primary income stream from shares sold, but may not included additional items (i.e., bread, or other processed items) that are sold by the CSAs. Both measurements compared favorably. Across the first three survey years for Northeast CSA

Table 2. Reported Costs and Revenue for the CSA Operations.								
	Average $ - 1995		Average $ - 1996		Average $ - 1997		Average $ - 2001	
	per Farm	per Share	per Farm	per Share	per Farm	per Share	per Farm	per Share
Reported Revenues	$33,398	$444.77	$35,568	$460.18	$32,182	$349.65	$34,990	$399.75
Reported Costs	$30,674	$408.50	$28,254	$365.56	$23,362	$253.82	$19,455	$288.46
Net Incomes	$2,724	$36.27	$7,313	$94.62	$8,820	$95.83	$15,535	$111.29

farms, 1995, 1996, and 1997, average revenues were $33,398, $35,568, and $32,182, respectively. In 2001, average revenue was $34,990. Revenues per share were $408 in 1995, $460 in 1996, $359 in 1997 and $400 in 2001, on average. These revenue and expense data were combined to assess whether the CSA operations were successful in covering their costs. Net incomes for the CSA outfits provided by all survey respondents showed a positive result. In 1995, net income was $2,724 per farm on average, which was $36.27 per share. In next two years, net incomes were $7,313 (1996) and $8,820 (1997), on average. Those figures represent much higher net incomes per share, $94.62 and $95.83 per share, in 1996 and 1997, respectively. The average net income in 2001 was $15,535 per farm and $111.29 per share. It appears from the survey data gathered from both Northeast CSA farms and the national sample that the viability of CSA, purely in terms of covering costs, has improved.

The resulting figures in Table 2 show that, on average, CSA farms earned a positive net income according to their reported costs. The farms were therefore apparently able to at least fulfill the goal of meeting input costs. The positive net incomes, however, do not truly reflect the full costs associated with production because an analysis of survey results reveal that many farmers did not include the cost of their own labor as an cost factor. These farm operators evidently consider themselves residual claimants, implying that net returns will determine their salary. To achieve a reliable estimate of CSA economic profitability, labor expenses were estimated to recalculate the farms' net income, a measure of viability.

The survey questionnaires were designed to collect additional detailed information on labor used for CSA operation. Included were questions on wages and hours worked by each employee type; operators, family members, and full and part-time workers. Additional information was requested on non-cash benefits, fringe benefits, and other benefits provided to employees. In addition to labor expenses for hired workers (see Appendix A), wages to the operators, family members, full and part-time employees, and cost of fringe benefits should be included in CSA farm costs. The additional information gathered on hours worked by each employee type allowed us to identify farms that did not include the true value of labor costs in the expenses. In many cases, total cash wages did not include enough detail to identify the wages paid to the CSA operator even though the operator hours were applied to the production of the CSA. Additionally, some farms included employee hours, but did not provide the wages paid to those employees. To value all labor consistently between farms, total hours worked by employee classifications were multiplied by set wage rates of $10.00 per hour for operators, $5.00 /hr for family members, and $7.00 /hr for both salaried and part-time hands. While these wage rates are not appropriate to all CSA farms, they were chosen based on average wages paid by CSA farms

Table 3. Average Hours per Week by Labor Category.				
	Average Hours			
Labor Category	**1995**	**1996**	**1997**	**2001**
Principle Farmers	33.01	28.59	31.83	32.30
Other Paid Employees	18.30	33.48	26.70	41.19
Unpaid Labor	4.43	6.26	5.61	5.86
Shareholder Labor	0.11	0.12	0.13	0.46
Total	55.85	68.45	64.26	79.81

that did report wage rates in 1995 and 1996 and were then applied across all survey years. Using these rates, we were able to calculate imputed wage outlays for each farm. Imputing the total cost of labor for all farms provides consistent CSA cost estimates across all farms and reflects, at least consistently across all farms, the opportunity costs of all labor resources used by CSA operators.

Our classification of farm CSA farm labor and the number of hours worked per week are shown in Table 3. These statistics represent the average number of hours worked per week over the entire CSA season for a given survey year. Appendix C displays the average number of hours recorded per month for both paid and unpaid employees. Operator hours per week remain relatively consistent with an annual average of approximately 30 hours. 'Other paid employees' include the average sum of family member, part-time, and full-time worker weekly hours. There is clearly more variation across the four samples in the average weekly labor contribution of these categories. It may be that the respondents had less reliable information about how many hours individuals within this group worked leading to the higher variance. Average unpaid labor and shareholder labor contributions per week were rather small compared to other employee types overall and, in addition, are not included in the imputed wages because they are not considered an expense of the CSA farm.

Table 4 shows the imputed wages for CSA operations. These figures provide a consistently computed estimate of all labor costs, including an assessment of the opportunity costs for the CSA farm operators. The total cost of reported wages shown in the first row are the average labor costs reported by the survey respondents. The individual labor cost components and the resulting imputed labor costs for the operator (valued at a wage of $10/hour), family labor ($5/hour) and all other paid employees ($7/hour) are shown in Table 4 below. The average reported cost of labor was $15,184 in 1995, $11,620 in 1996, $10,047 in 1997, and $22,005 in 2001. In contrast, total average imputed labor expenses per CSA were determined to be $29,986 in 1995, $24,198 in 1996, $23,701 in 1997, and $34,627 in 2001. A comparison of these figures clearly shows that imputed wages are far higher than reported wages. It is expected because the imputed labor expense encompasses the value of all labor, including the operator and unpaid labor, as well as cost of fringe benefits and contract labor. Fringe benefits include costs of life insurance, retirement plans, social security taxes and other compensation. Non-cash benefits such as housing, food, library usage, use of vehicles, etc., were not included in the total imputed labor expenses.

Table 4. Average CSA Operation Costs Including Imputed Wages ($).			
	1995	**1996**	**2001**
Total Cost of Reported Wages	15,184.12	11,619.78	22,004.90
Imputed Wages:			
Wages of Operator	16,721.16	13,788.87	20,441.63
Wages of Family Labor	1,950.39	1,628.24	1,013.95
Wages for Other Paid Employees	8,042.35	6,832.18	11,270.56
Total Imputed Wages	26,713.90	22,249.29	32,726.14
Cost of Fringe Benefits	2,789.58	1,886.49	1,901.29
Cost of Contract Labor	482.61	62.40	N/A
Total Imputed Labor Expense	29,986.09	24,1968.18	34,627.43

The imputed labor costs were used to revise the calculations for CSA farm net income. CSA farms are viable if all resources are paid a competitive wage, especially the CSA farm operator. Part of the CSA ideal is to insure a living wage for the farm operator. Revised net incomes for the CSA operations were calculated using the sum of imputed labor expenses and the reported expenses for all other input categories. These new net incomes will be referred to as *imputed net incomes* in the remainder of the discussion. All labor costs reported by the CSA farms were deducted before including the imputed costs in order to insure there was no double counting of labor expenses. Table 5 illustrates the calculations of imputed net incomes for an average CSA farm in each of the three survey years.

As the results in Table 5 indicate, average *imputed net incomes* for the CSA farm operations were negative in all four years. In 1995, more than half the respondents (14 of the 23) had negative imputed net incomes and the average imputed shortfall per share was $161. In 1996, 14 of the 26 respondents had negative imputed net incomes, but the average shortfall represented only $68 per share. In 1997, 24 of 33 respondents had negative imputed net incomes and produced at a shortfall of $53 per share. The magnitude of the average shortfall of $43 for 2001 was the smallest of all four survey years, although 39 of 54 respondents had negative imputed incomes. Total imputed net income averages for CSA farms showed that the price of the average CSA share did not cover the costs of production when the imputed labor costs were applied. However, analyzing the differences in shortfalls between years suggests a trend of improved cost management by CSA operators. Secondly, these estimates are based on assumed wages and respondent estimates of the number of hours worked by each category of labor. These are only estimates and may overstate the value of the labor contribution, especially if the number of labor hours estimated by the respondent overstates the true number of hours.

Table 5. Imputed Net Incomes for CSA Operations - 1995, 1996, 1997, 2001								
	1995		1996		1997		2001	
	$ per Farm	$ per Share	$ per Farm	$ per Share	$ per Farm	$ per Share	$ per Farm	$ per Share
CSA Reported Revenue *	33,398	445	35,686	460	32,182	350	34,990	398
CSA Cash Expense *	30,674	409	28,254	366	23,362	254	19,455	221
Reported Cash Wages	15,185	202	11,620	150	10,047	109	13,380	152
Cash Expense less Reported Cash Expense	15,490	206	16,635	215	13,315	145	6,075	69
Imputed Labor expense **	29,986	399	24,198	313	23,407	258	32,726	372
Imputed Cash Expense	45,476	606	40,833	526	37,016	403	38,808	441
Imputed Net Income (Reported Net Income less Imputed Cash Expense)	-12,078	-161	-5,265	-68	-4,834	-53	-3,811	-43
* - See Table 2; ** - See Table 4.								

The existence of a core-group is a common attribute to many CSA operations, especially in the Northeast. The purpose of the core-group is to represent economic and ethical intentions of the farm's shareholders as well as to assist the farm's management in producing desirable share market baskets. Table 6 displays a comparison of summary statistics for core and non-core group CSAs. Of the twenty-three surveys received in 1995, eleven of the 23 farms (48 percent) had core-groups. The proportions were similar for 1996 and 1997. Of the 1996 and 1997 survey respondents, 46 percent and 45 percent of the CSA farms had core-groups, respectively. These were all Northeast farms and the core-group phenomenon is most prevalent in the Northeast. For the 2001 national sample, the percentage of CSA's that utilized core-groups was lower (30 percent), with 17 of the 56 surveyed establishments reporting that they did have a core-group. The degree to which the core-groups were involved in farm decision-making was not measured by the survey across all four survey years. Thus, despite knowing what farms used a core-group, we do not know the extent to which the core-group participated in CSA farm decision-making process.

Table 6 also shows the proportion of CSA farms that succeeded in covering costs during each of the survey years. Nine of the 23 CSA farms surveyed in 1995 (39 percent) earned positive net income. In 1996, twelve of the 26 farms surveyed (46 percent) earned positive net income while 27 percent earned positive net incomes in 1997. For 2001, sixteen of the national sample of 56 farms surveyed (29 percent) had positive net incomes. CSA operations with core-groups were more likely to have covered costs in each of the survey years. Among the 1995 core-group farms, 64 percent had revenues greater than or equal to costs; whereas only seventeen percent of the 1995 non-core farms had revenues that exceeded costs. Core-group farms included in the 1996 survey also fared better than farms without core groups; 75 percent of core-group farms had positive net revenues, compare to only 21 percent for the non-core farms. Respondents in 1997 and 2001 showed similar results. In 1997 and 2001, 46 percent and 29 percent of CSA operations with core groups had revenues that met or exceeded costs. Conversely, for the non-

Table 6. Number of CSA Operations with and without Core Groups.								
	1995		**1996**		**1997**		**2001**	
	Core	Non-Core	Core	Non-Core	Core	Non-Core	Core	Non-Core
Profitable [1]	7	2	9	3	7	2	5	11
Unprofitable [2]	4	10	3	11	8	16	12	28
Total	11	12	12	14	15	18	17	39
[1] Implies that revenue ≥ cost								
[2] Implies that revenue < cost								

core farms 11 percent covered costs in 1997 and 28 percent covered costs in 2001. It appears that CSA operations with a core-group were better able to cover costs when compared to the general CSA population. Core groups may feel a special commitment to the CSA farm operation and may be more likely to raise share prices to pay the operator a living wage. However, concluding that positive net revenues are due to the existence of a core-group requires further analyses as there may be other confounding factors involved.

There are a number of factors that may contribute to a CSA farm's ability to cover production costs. Comparing various factors such as farm characteristics and their effects on farm costs and returns with and without a core-group may lead to some suggestions as to why core farms did better in our survey years. Table 7 presents several additional summary statistics for CSA farms including total cropland acres, CSA operated cropland acres, the number of full share equivalents, and the price to shareholder per full share equivalent. On average, CSA farms with core-groups have more cropland as well as more acreage devoted to the CSA operation than do non-core farms. Farms with core-groups also produce greater numbers of shares and charge higher prices per share. For example, core-group farms in 1995 produced the equivalent of about 96 full shares at an average price of $559 in 1995 while non-core farms produced 54 full share equivalents at a price of $312, on average. The core-group CSA share prices were approximately a 36 percent greater than the average non-core farm share price. The following survey years show a consistent ability of CSA firms to establish a higher share price. In 2001, the average share price for core-group farms was over 27 percent higher than the non-core CSAs and the total number of full share equivalents was more than twice as great.

The data indicate that core-group farms are generally larger, which explains the greater number of full shares. However, larger farm size does not necessarily explain the higher average price per share that the core-group farms charge. After considering the data on net income and the average prices per share, it appears that core-group farms are, on average, more effective at covering costs. It is difficult to draw further conclusions without additional analysis because we do not know whether larger farms find the core-group system of management more efficient or if the existence of a core-group leads to more efficient CSA organization. This question of causality remains unanswered. Research by Sanneh, Moffitt and Lass (2001) has shown that the core-group strategy is a dominant strategy for risk management.

Table 7. Core and Non-Core Farm Characteristics – 1995, 1996,1997, 2001.								
	1995		**1996**		**1997**		**2001**	
	Core	Non-Core	Core	Non-Core	Core	Non-Core	Core	Non-Core
Total Number of Farms	11	12	12	14	15	18	17	39
Cropland (acres)	32.68	12.58	26.91	21.75	25.57	13.29	25.96	12.79
CSA Operated Cropland (acres)	18.32	6.13	16.08	6.25	11.69	4.72	9.86	3.66
Number of Full Share Equivalents	96.3	53.9	89.9	64.7	104.7	79.4	134.1	64.4
Price per Full Share Equivalent	$558.75	$312.73	$486.73	$350.38	$408.73	$309.78	$416.11	$326.78
Number of Full Share Equivalents was calculated using information from pervious table data for 1995, 1996, and 1997. 1997: Total AvgFSE for Core and NonCore was calculated given the same % ratio as Price per Core and NonCore Shares.								

Summary statistics presented above suggest that, on average, core-group CSAs tend to cover costs better than CSAs without core-groups. A comparison of CSA revenues, imputed costs and the resulting imputed net income for core and non-core CSA farms is shown in Table 8. The results indicate that the average core-group CSA had both higher revenues and costs, but that the net incomes for core-group CSAs were greater, on average. For example, in 2001 CSA farms with core groups earned an average of $62,012 in revenue. Average imputed costs for core-group farms in 2001 were $61,459. Farms lacking a core-group generated only $20,354 in revenue with imputed costs of $36,354. The significantly larger income stream can be attributed to greater CSA acreage cultivated by farms with core groups, a greater number of full share equivalents and the higher share prices. Additionally, it should be noted that core-group farms provide a greater amount of produce per share, on average, one explanation for the higher price per share (Rattan). Appropriately, farm production expenses also rise with the inclusion of a core-group, partially due to the increase in farm scale. The average imputed net incomes shows that CSA establishments with core-groups earn a considerably larger net profit than non-core establishments. Our national sample of 2001 CSA farms shows that core-group farms earned a slight net income of $553, which is $6 per full share equivalent, whereas non-core CSA's had a loss of $185 per share. Considering the average imputed net incomes per share for core-group CSA farms, we would conclude that these farms have done an excellent job of attaining the CSA ideal of providing shares at the full cost of production.

Table 8. Comparison of Core and Non-Core CSA Farm Revenues, Costs, and Net Incomes								
	1995		**1996**		**1997**		**2001**	
	Core	Non-Core	Core	Non-Core	Core	Non-Core	Core	Non-Core
CSA Revenue	$53,307	$15,147	$60,522	$14,179	$56,300	$14,378	$62,012	$20,354
Cash Expenses	$54,196	$28,870	$64,125	$25,425	$55,460	$21,186	$61,459	$36,354
Net Income	-$889	-$13,723	-$3,603	-$11,246	$840	-$6,808	$553	-$16,263
Net Income per Share	-$9	-$300	-$31	-$265	$6	-$135	$6	-$185

The bottom line for core-group farms is that, on average, they came very close to the ideal of zero net income when we consider *imputed* costs, which include a wage for the CSA operator. Average net income per shares was negative for core-group farms in 1995 and 1996, but by only $9 and $31, respectively. In 1997 and 2001, core-group farms earned a positive net income of $6 on average. This is in contrast to non core-group farms that had average negative net incomes in all four of the survey years.

CSA Behavioral Models

CSA farms seek to achieve goals other than or in addition to economic profitability. However, one basic requirement is that the CSA meet economic costs in order to remain viable. It is therefore useful to try and relate farm characteristics to net revenues or economic net profits, share prices and number of shares sold. The results of multivariable relationships through regression analysis can help us better understand the characteristics that are related to CSA viability and how different farm characteristics affect viability for the sample of 2001 CSAs.

Fifty-nine respondents provided complete information on their CSA farm 2001 operating expenses. This sample was gathered from across the contiguous United States. Elements of interest were extracted for analysis. The factors included in this analysis are listed in Appendix C and fall into six categories: primary farmer characteristics, farm characteristics, shareholder participation, marketing methods, shareholder membership, and other miscellaneous characteristics.

We proceed with regression analysis as follows. Three full models are specified for three dependent variables: Number of Full Share Equivalents (FSEs); Price per Full Share; and Net Returns. The model for the number of FSEs represents a classic supply function for agricultural firms. We would expect that factors that affect CSA farm costs and the endowments of the CSA farm in terms of acreage and human capital would affect the CSA farm's supply. Typically in agriculture, farmers are "price takers." They have little to no control over the price they receive for their products. If CSA farms have the ability to set their own price, then we might expect that price per full share will depend upon farm characteristics. Finally, farm characteristics that affect costs and productivity will affect farm net returns – a measure of farm viability. After estimating these fully specified models, we then investigate further the variables that are most important by testing a set of zero restrictions on model parameters that essentially are model reduction tests. Variables with low t-test statistics were identified as being statistically insignificant and were dropped from the full specification. Additionally, the joint hypothesis tests (sets of zero restrictions) were completed using F-tests. These tests aid us in identifying the factors that are important to our limited definitions of CSA "viability or success."

Full Share Equivalents

Data collected during the 2001 survey identified three different principal types of shares offered by responding CSA establishments; full shares, half shares, and other shares. Other shares represent a unique bundle of farm goods tailored to the demand of the shareholders in order to provide a greater amount of satisfaction. On average though, full shares was the most

prevalent form of shares offered. In order to develop a measure of overall number of shares sold to CSA members, full, half, and other shares were weighted by their prices relative to the price of the farm's full share to produce the number of *full share equivalents* (FSE). This represents a measure of total CSA supply offered consumers in terms of a full share. The number of FSE's was estimated using a basic set of independent variables representing CSA farm characteristics and the price per full share. We would expect that CSA farms would be willing to supply more shares if the price per full share were higher, consistent with economic theory of supply for profit maximizing producers.

A "full" model specification was estimated for the regression of the number of FSEs sold. These results are shown in Appendix table D. A number of factors were not statistically important, including the price per full share. The estimated effect of the price per full share on the number of FSEs sold was also negative, contrary to what economic theory might predict. We also found that farmer characteristics such as age, gender, and education were not statistically important. While education is a measure of human capital and should affect productivity, there is little variation in the level of CSA education for CSA farmers. We did find that the number of years the farmer had been a CSA farmer was statistically important. Marketing variables such as whether the CSA also had a "U-pick" operation, other on-farm sales and direct sales to retailers were also not important to the number of FSEs sold. But, roadside stands and wholesale offerings by the farm were important.

The final reduced model specification is presented in Table 9. An F-test was conducted to determine whether the variables dropped from the model explained a statistically significant portion of the variation in the number of FSEs sold. The results suggest that the variables dropped from the model did not have a joint statistically important affect on the dependent variable. We again find that the price of a full share is not statistically important, although the effect on the number of FSEs sold is positive as expected. The experience of the primary CSA farmer is an important variable. With every additional year of experience, the number of FSEs sold increases by about 9.5 shares. Two measures of farm scale are also statistically important; the number of acres of cropland and the number of acres devoted to the CSA both positively affect the number of FSEs sold. Previous research in the Northeast found that core-group CSAs sold more shares. Here, we find that core-group farms do not sell more FSEs, indeed there appears to be a significant negative effect for the "active core-group" farms. The relative scarcity of core-group farms across the U.S. may lead to this unanticipated effect. Two marketing variables are found to be important; whether the farm has a roadside stand and whether the farm sells to wholesale markets. The presence of a roadside stand may help to advertise the CSA farm to community members. The positive statistical effect of wholesale marketing may indicate larger more efficient farms. Finally, the growth of the CSA farm, measured in terms of the percentage increase in membership, also had a positive effect on the FSEs sold as expected.

The variables included in the model of FSEs do well in predicting the number of full shares sold. We found that the model explains about 77 percent of the variation in the number of FSEs. The calculated F-statistic of 10.08 that exceeds the critical F-statistic suggesting the model is statistically significant. While there is still much to learn about CSA supply decisions, these results provide some preliminary estimates to guide future research.

Table 9: Full Share Equivalents including Price per FSE – Reduced Model

```
Predictor          Coef       SE Coef         T          P
Constant         -75.84        55.77       -1.36      0.184
PpFSE            0.0194       0.1223        0.16      0.875
FA-csa            9.437        4.981        1.89      0.068
LandCrop         0.7913       0.3947        2.00      0.054
LandCSA          11.378        1.917        5.93      0.000
Core1             23.54        35.39        0.67      0.511
Core2           -110.70        51.76       -2.14      0.040
HrsSHldr        0.00624      0.01058        0.59      0.560
mk2-road          65.48        43.60        1.50      0.143
mk2-whl           46.42        27.57        1.68      0.102
shrhdchg          38.97        19.59        1.99      0.056


S = 76.34       R-Sq = 76.5%     R-Sq(adj) = 68.9%
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ANOVA					
Source	**DF**	**SS**	**MS**	**F**	**P**
Regression	10	587308	58731	10.08	0.000
Residual Error	31	180650	5827		
Total	41	767958			

Prices per Full Share Equivalent

The price per full share is the price charged to consumers for a full share. In agriculture, we typically assume that farmers are price takers and have no control over the price of their product. Thus, if farmers do behave as price takers, we would expect poor results for our attempts to model the price of full share. Alternatively, if CSA farmers can set their own price, then farm characteristics and consumer characteristics would affect price. Results are shown in Appendix Table E for a model that includes many of the variables available. A reduced model is shown in Table 10. We found there were few variables that had a statistically important effect on the price per full share. The presence of an active core-group had a strong positive effect on share price. This may explain the negative effect of the core-group variables on the number of FSEs sold. With a higher price and an objective of covering costs, there is less need for CSA farmers to increase production of shares. On-farm marketing and hours of labor supplied by shareholders both had negative effects on the full share price.

The reduced model does explain about 29 percent of the variation in the price per full share, and the F-statistic shows that the amount of variation that we can explain is statistically important. as grown to 4.15, which exceeds the tabulated limit of the F-distribution of 2.45 at df1 of 5 for the explained variance and a df2 of 40 for the unexplained variance. The F-test of model reduction confirmed that the 14 variables excluded from the final model shown in Table 10 were not statistically important. Thus, we would conclude that CSA farmers do not appear to have the ability to set the price of their shares, unless they have a core-group, especially an active core-group. This is suggests that although CSA farmers do state their CSA price during the pre-season marketing phase, they may primarily react to what other CSA farmers are charging for a full share and may therefore follow a "price taking" form of behavior. Our multivariate results here confirm what we presented earlier, core-group CSA farms do earn higher prices per share. CSA core-groups may be more willing than the farmer to set share prices high enough to ensure that the farmer earns a living wage.

Table 10: Price per Full Share Equivalent – Reduced Model.

Predictor	Coef	SE Coef	T	P	T
Constant	331.13	43.19	7.67	0.000	
FA-sex	55.06	52.30	1.05	0.297	1.16
Core1	62.37	60.51	1.03	0.308	1.30
Core2	211.85	89.18	2.38	0.021	1.32
HrsSHldr	-0.03190	0.01982	-1.61	0.114	-1.32
mk2-farm	-134.15	55.26	-2.43	0.019	-1.36
S = 168.0	R-Sq = 29.3%	R-Sq(adj) = 22.2%			

ANOVA					
Source	DF	SS	MS	F	P
Regression	5	585108	117022	4.15	0.003
Residual Error	50	1411541	28231		
Total	55	1996650			

CSA Profitability

The implicit primary motive of CSA operators is not to generate excess profit, rather they seek to provide shareholders with high quality organic produce at a price reflective of the cost of inputs. If the CSA covers its costs, then it can be deemed a success. On average, CSA farms in 2001 came close to meeting their costs. While on average, these CSA farms came close, there is a great deal of variability in how individual farms did in covering their costs. What we wish to investigate here is the amount of that variability that we can explain by using factors such as CSA farm characteristics.

The full CSA profit model is shown in Appendix Table F. Table 11 shows the reduced model relating CSA characteristics to farm profits. If CSA farms seek to maximize profits, then we would expect a number of supply and cost variables to significantly affect the CSAs profits level. While a great number of variables do not affect CSA profit, there remain several important factors. First, consistent with our expectations from economics, a higher share price leads to higher profits. While this is consistent with CSA farms acting as competitive profit maximizing firms, it is also intuitive; holding all else constant, CSAs with higher prices will earn more. We also find that one measure of human capital, the years of CSA experience for the primary farmer, does have a significant positive effect on profit level. We cannot tell whether this effect is due to improved efficiency of the CSA for each year of experience, or if this is a "demand effect" due to better exposure to the community over time. There is a relatively weak signal that there may be diseconomies of scale for CSA farms. The greater the number of acre of cropland, the lower the profit level. Consistent with our finding that active core-group CSA farms charged higher share prices, we also find that CSA farms with active core-groups had higher profit levels as well. Two marketing variables were also statistically important. CSA farms that sold produce at farmers markets had higher profit levels as did CSA farms that had a farm stand. Both these forms of marketing may serve as advertising for the CSA farm leading to a more successful and viable CSA farm. Surprisingly, we found that growth of the CSA, which had a positive effect on the number of FSEs sold, had a negative effect on CSA profit level. Growth of the CSA did not necessarily improve the viability of the CSA farm.

The reduced model in Table 11 explained about 46 percent of the variability in CSA profts. The F-statistic, a measure of statistical importance for the variables that remain, shows that these variables do explain a statistically important portion of the variability in CSA profit levels. The variables that we found were important included not only farm characteristics, but also marketing or consumer demand characteristics.

Table 11: CSA Profit Model – Reduced Model

Predictor	Coef	SE Coef	T	P		
Constant	-1597.3	414.9	-3.85	0.001		
PpFSE	1.5901	0.8154	1.95	0.060		
FA-csa	70.47	32.83	2.15	0.039		
LandCrop	-3.536	2.633	-1.34	0.188		
Core1	-230.5	268.3	-0.86	0.396		
Core2	710.7	355.6	2.00	0.054		
mk2-mkt	679.8	193.9	3.51	0.001		
mk2-road	613.9	314.9	1.95	0.060		
shrhdchg	-209.7	145.7	-1.44	0.160		
S = 556.7	R-Sq = 46.3%		R-Sq(adj) = 33.3%			
ANOVA						
Source	DF	SS	MS	F	P	
Regression	8	8825042	1103130	3.56	0.004	
Residual Error	33	10228075	309942			
Total	41	19053118				

In general, we find that there are elements of these "behavioral models" that are consistent with economic theories of supply by profit maximizing competitive firms. We find important CSA characteristics that improve supply and profit levels. These factors include CSA experience, a measure of human capital, and the scale of the operation. But, clearly these models are inadequate, as we would expect. Specifically active core groups have important effects on measures of CSA success from supply, to pricing shares, to CSA profit level. The communal decisions made farms with active core groups, on average, differentiate these CSA farms. On average, they produce fewer shares, charge higher prices and earn higher profit margins. These factors suggest CSAs that can remain viable and CSAs with shareholders that may be more concerned about the viability of the CSA and welfare of the CSA farmer. These results suggest that shareholders may be more willing to support the CSA farmer with a living wage that is the CSA farmer herself. Marketing of CSA products should also be a major concern. Sales through roadside stands and farmers' markets raise the level of attention that CSA's receive and thereby improve the viability of the CSA.

Conclusions

Community Supported Agriculture is an innovative marketing approach. CSA operations practice alternative/organic method of production and sell their product as shares of produce from the farm. The operator benefits from lower direct marketing costs and the ability to spread risk. Consumers benefit because they typically receive locally grown, quality organic produce that has been found to often be less expensive the retail alternatives. Noncommercial benefits include reduced impact on the environment as a result of sustainable production, the integration of the farm with the local community, providing educational opportunities to the local community, and providing surplus food to local food banks. The goals of this research were to examine the economic viability and draw some implications about behavioral aspects of this novel approach to agriculture.

One objective of this research was to investigate the economic viability of CSA farms. Our definition of viability is admittedly limited. We focused in this study on the ability to cover full economic costs by CSA farms. If the farm earns normal profits (*profit = 0*), then it is viable. While our definition of viability is limited, it is consistent with the ideology of CSA, that the price for the share should reflect the costs of producing that share, including a living wage for the farmer. Our goal was to assess whether the CSA farms surveyed achieved that ideal, which is consistent with *normal* (or zero) economic profits. The survey results presented here suggest that CSA farms appear viable based on reported costs and returns. However, we also find evidence that CSA operations do not take into account the full economic costs of production, especially wages for the farm operator. While this may be a choice made by the operator, it would not seem to be a sustainable choice. When the operator was paid a wage, on average, the operations surveyed earned a net negative income. If these farms were to take into account the full economic costs of production and price their share accordingly, the CSA would be a viable approach to agriculture.

In CSA farms with a core-group, shareholders and the farmer may bargain over the price and content of a share. The results suggest that core-group farms are more successful, possibly because of the interaction between shareholders and farmer on the CSA budget. CSA shareholders may well be much more willing to insure the farmer receives a fair wage for her/his services. Regression analyses confirmed the implications of the summary statistics; CSA farms were found to earn more in net income.

We found that our results offered contrasts to classic profit maximizing behavior by competitive firms. It appears that core-group CSA farms would be appropriate for a bargaining model of economic behavior and the results of the survey infer that may be a possible model of CSA behavior. It is reasonable to assume that greater altruism or 'warm-glow' by the shareholder would have a positive effect on the optimal share price; whereas, the 'warm-glow' of the farmer would have a negative affect on the share price. The model offers plausible explanations for some observed CSA operator behavior. Bargaining that takes place between a core-group and the farmer presents a vehicle by which consumer and farmer warm-glow effects can influence price.

Appendices

Appendix Table A. Detailed Average Reported Costs for CSA Operations: 1995, 1996, 1997, 2001

Budgeted Item	1995	1996	1997	2001
Total expense for hired workers	15184.1	11619.8	10047.1	17429.55
Real Estate expenses	331.02	371.87	366.72	1207.08
Depreciation	3818.23	2775.5	2075.15	2201.46
Seed, plant, and seed treatment	1191.52	1335.64	1258.82	1336.39
Repairs for vehicles, equip, etc.	1579.49	2057.29	1717.21	977.53
Farm supplies and hand tools	1475.49	1938.31	1569.83	1188.22
Other miscellaneous expenses	393.2	875.45	903.77	433.54
Fertilizers and soil conditioners	776.99	768.7	810.03	912.43
General business expenses	2879.14	3309.45	2107.64	824.02
Utilities	814.99	1049.97	868.89	527.18
Marketing expenses	320.35	384.52	239.6	468.57
All fuels, oils, LP gas, etc.	1043.64	1082.5	709.38	450.67
Pest control	145.08	178.93	103.8	293.55
Custom work	267.02	235.47	251.09	327.53
Registration fees and license fees for vehicles	60.58	52.65	42.53	165.66
Rental or lease of equipment, etc.	393.15	201.77	263.26	169.75
Other property and excise taxes	0.1	16.52	27.1	65.24
Total	30674.09	28254.34	23361.92	28978.36

Appendix Table B. Detailed Average Reported Costs per Share for CSA Operations: 1995, 1996, 1997, 2001

Budgeted Item	1995	1996	1997	2001
Total expense for hired workers	202.21	150.34	109.16	198.06
Real Estate expenses	4.408	4.81	3.98	13.72
Depreciation	50.85	35.91	22.55	25.02
Seed, plant, and seed treatment	15.87	17.28	13.68	15.19
Repairs for vehicles, equip, etc.	21.03	26.62	18.66	11.11
Farm supplies and hand tools	19.65	25.08	17.06	13.50
Other miscellaneous expenses	5.24	11.33	9.82	4.93
Fertilizers and soil conditioners	10.35	9.95	8.80	10.37
General business expenses	38.34	42.82	22.90	9.36
Utilities	10.85	13.58	9.44	5.99
Marketing expenses	4.27	4.98	2.60	5.32
All fuels, oils, LP gas, etc.	13.90	14.01	7.71	5.12
Pest control	1.93	2.32	1.13	3.34
Custom work	3.56	3.05	2.73	3.72
Registration fees and license fees for vehicles	0.81	0.68	0.46	1.88
Rental or lease of equipment, etc.	5.24	2.61	2.86	1.93
Other property and excise taxes	0.01	0.21	0.29	0.74
Total	408.50	365.56	253.82	329.30

Appendix Table C: Variable List and Definitions for CSA Regression Analysis.

Type	Name	Regression Name	Meaning
Primary Farmer Characteristics	Farmer Age	FA-age	Age of principle farmer
	Education Level	FA-colg	Whether principle farmer attended college, Yes=1, No=0
	Sex	FA-sex	Male=1, Female=0
Farm characteristics	Cropland	LandCrop	Acres of total cropland
	CSA Cropland	LandCSA	Acres of CSA cropland
Shareholder Participation	Core-Group	Core1	Existence of core group, Yes=1, 0=No
	Active Core-Group	Core2	Actively participating core group, Yes=1, No=0
	Shareholder labor hours	HrsShrldr	Annual number of shareholder hours contributed to CSA
Marketing Method	Road Stand	mk2-road	Product sold via road side stand
	Farmers Market	mk2-mkt	
	U-Pick	mk2-upik	Product sold via U-pick
	On Farm	mk2-farm	Product sold via on farm sales
	To Retail	mk2-drct	Product sold via direct to retail
	To Wholesale	mk2-whl	Product sold via wholesale
Shareholder Membership	Membership Change	shrhdchg	Percent change in membership between 2000 and 2001
	Membership Renewal	shrhdrnw	Percent change in renewal rate between 2000 and 2001
Other	FSE	FSE	Equivalent number of full shares produced by CSA
	Private land used to farm	LandRPrv	Privately owned land, Yes=1, No=0

Appendix Table F: Estimated Regression Model for CSA Profits.

Predictor	Coef	SE Coef	T	P
Constant	-653	1102	-0.59	0.560
PpFSE	1.596	1.282	1.25	0.228
FA-age	-7.52	14.27	-0.53	0.604
FA-Colg	121.9	297.7	0.41	0.686
FA-yrs	-5.04	23.51	-0.21	0.832
FA-csa	50.25	47.35	1.06	0.301
FA-sex	-48.8	286.9	-0.17	0.867
LandCrop	-6.814	4.144	-1.64	0.116
LandCSA	-6.34	24.73	-0.26	0.800
Core1	-287.1	329.0	-0.87	0.393
Core2	620.8	502.9	1.23	0.231
FSE	1.901	1.640	1.16	0.260
LandRPrv	-218.5	241.8	-0.90	0.377
HrsSHldr	0.0247	0.1110	0.22	0.826
mk2-mkt	563.5	309.7	1.82	0.084
mk2-road	554.3	438.2	1.26	0.220
mk2-upik	-213.9	453.4	-0.47	0.642
mk2-farm	263.3	369.0	0.71	0.484
mk2-drct	-243.6	280.7	-0.87	0.396
mk2-whl	153.2	302.7	0.51	0.618
shrhdchg	-260.7	183.1	-1.42	0.170
shrhdrnw	-5.335	7.572	-0.70	0.489

S = 608.7   R-Sq = 61.1%   R-Sq(adj) = 20.3%

ANOVA

Source	DF	SS	MS	F	P
Regression	21	11643597	554457	1.50	0.186
Residual Error	20	7409521	370476		
Total	41	19053118			

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