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Determining the Methods for Measuring the Economic and Fiscal Impacts Associated with Organic Crop Conversion in Iowa

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II. Executive Summary

This research demonstrates methods for comparing the potential region-wide economic impact value of organic versus conventional crop practices. The impetus for this research was the passage of a county ordinance in Woodbury County, Iowa, allowing a maximum of $50,000 of county property tax abatements for qualifying conventional-to-organic production conversions.

This study used Iowa State University Cooperative Extension Service crop enterprise budget information to compare the returns to operators of two productions systems: a conventional corn-soybean rotation versus an organic rotation consisting of corn–soybeans–oats-alfalfa. That information was translated into a format for inclusion within an input-output model of the Woodbury County economy. That modeling system accounts for how industries buy labor and inputs for production and what the consequences are to the regional economy when labor and other input demands change.

The research demonstrated that there are very strong differences not only in the superior average returns to organic farming operators when compared to conventional corn–soybean operations, but in the overall economic impacts. Comparing the two scenarios and supposing 1,000 acres in each, we found that the organic rotation produced 52 percent more industrial output economic impact (gross sales) than the conventional option, 110 percent more value added, 182 percent more labor income, and 56 percent more jobs from the same 1,000 acres of production than from conventional corn and soybean rotations.

The research next evaluated the overall economic efficiency of the county property tax abatement program. *Economic efficiency* means that the county engaged in an activity designed to promote a desirable community outcome, and in the course of doing so, recovered its forgone tax dollars. Our research found that the five-year abatement program would be worth $14,119 a year for 1,000 acres of converted organic land and that the county could therefore support 3,541 acres of conversion with its $50,000 property tax abatement program. The research found that the labor income economic impacts of the organic conversion would generate $7,918 annually in property taxes, leaving an annual estimate gross property tax deficit of $6,281. The research noted that, because the region was generating more laborers paying those property taxes, their households would require county services leaving the net increase in property taxes *after paying for county services* to be very close to zero. This leads us to conclude that it is unlikely that the economic impacts of the conversion would be sufficient to repay the property tax abatements over a reasonable period of time.

III. Technical Report

A. Introduction

The purpose of this research is to specify and demonstrate methods for comparing the potential regional economic value of organic versus conventional crop practices. The impetus for this research was the passage of a county ordinance in Woodbury County, Iowa, allowing property tax abatements for qualifying conventional-to-organic production conversions. This research is intended to fill a gap in applied economics research on the differential economic impact values of organic crop production and their linkages to area economies when compared to traditional farming practices.

There are three straightforward expected outcomes to this research:

1. A clear and replicable articulation of our methods of analysis,
2. A clear and understandable measurement of the regional economic value of the two approaches to farming, and
3. A foundation for debating the utility of using tax-based incentives to stimulate organic production.

<u>Project Background and Rationale</u>

Consumer demand for organically produced goods has increased strongly and broadly in the United States. Many farmers are considering organic production as an alternative to conventional production practices. Changes from one kind of production to another, whatever the type of crop or commodity produced, result in shifts in the amounts and types of inputs to production. These shifts have consequences within the trade region where the changes are occurring. The shifts are often called *economic impacts*. Impacts can be negative and/or positive. Promoters of rural economic health and stability are highly conscious of the potential economic impacts of industrial gains and losses. Generating positive economic impacts within the agricultural sector is one strategy for enhancing rural economic well-being.

This research will compare conventional and widespread corn-soybean rotation production outcomes in Iowa with organic production substitutes to determine the kind and amount of potential regional economic impacts that might accumulate

from a change from one kind of farming practice to another. Previous studies by Delate, Duffy, Chase, et al, conducted experimental treatments comparing corn-soybean–oats rotations and corn–soybean–oats–alfalfa rotations grown organically against conventional corn–soybean rotations. That research and the continuing research data from those test sites help provide the analytical foundations for this analysis.

As of the 2002 agricultural census, 64 percent of Woodbury County cropland was in corn for grain or silage, 39 percent was dedicated to soybeans, and about 4 percent to hay and forage crops. There are, however, other organic conversions that might also be pertinent to Woodbury County agriculture. There were 682 acres of vegetable production present in the county and 9 acres of orchards. Growth in demand for organically produced fruits and vegetables is well-documented.

Livestock categories also are potential candidates for organic production. As of the last agriculture census, more than a third of all Woodbury County farms had cattle, 8 percent had hogs, fewer than 4 percent had sheep, and 3.5 percent had poultry. The county property tax breaks might potentially apply to grass-feed organic beef, organic pork production, or organic poultry. Compared to the remainder of Iowa, this county has a high number of cattle operations, and recent research by Larson, Kliebenstein, and Honeyman documents both cost and earnings differentials comparing organic with conventional hog production configurations.

Economic impact research comparing organic production with conventional production is truly in its early stages. To date, to our knowledge, there is only one published economic study comparing an organic system with non-organic systems (Pon Nya Mon and David Holland, 2005, The Land Institute). That research focused on apple production.

Economists use input-output models of regional economies to measure the linkages industries have with one another. Input-output models contain highly detailed accounting summaries of the kinds of purchases and sales that are made by firms in a study region. The models also contain estimates of the payments that producers make to production factors (labor, land, and capital), as well as industrial dependence on production imports from outside the area of scrutiny. A series of well-recognized econometric steps allow analysts to produce estimates of the total value of economic production in specific portions of the economy.

How widely the Woodbury County organic tax credit initiative will be used by producers remains to be determined. We assume that there is an intersection that will occur between the intention of the drafters of the ordinance and the collective desires of producers with an interest in organic production. Were those interests weighted in light of current production in the region, they would heavily favor conversions considering corn, soybean, and possibly cattle. As such, our analysis will be conducted with heavy reliance on the Delate, Duffy, Chase, et al., work because of the long duration of the research and the highly detailed findings. Additional research by Larson, Kliebenstein, and Honeyman provides important insights into the potential for organic pork production, and suggests a separate research question on the animal production side of the rural economy ledger.

Our intention here is to discern economic differences in organic production of corn, soybeans, oats, and alfalfa (a potentially strong market for the latter exists given the relatively large cattle populations in the area) as compared to the conventional corn and soybean rotation. The assumption *a priori* is that organic farming will require a different mix of production inputs and will make different payments to suppliers and factors than traditional crop or animal production. Because of this we would expect to identify differential results on the regional economy when comparing organic and non-organic cropping or animal production practices. The difference between the two conditions is measured with properly specified input-output models, which then produce results that summarize total industrial output (or gross sales), labor incomes, and jobs differences.

When Woodbury County government officials passed an ordinance allowing for a property tax abatement or credit to farmers who convert specific kinds of agricultural land to organic production, the operating expectation among the government officials was that conversion to organic production will have positive economic outcomes in the region and will, in turn, positively benefit the county's fiscal accounts.

This research uses Woodbury County as the study area from which we would simulate the economic impact of the two to three types of conversions measured with the input-output modeling system. In addition, using a different modeling approach and different methods, the researchers also will define and ascertain the amount of expected fiscal impacts (net change in area tax collections) that might accumulate were producers to take advantage of the county ordinance.

Stimulating Economic Activity Via Organics Promotion

Can organics production help to boost the fortunes of Midwestern rural economies? Can niche enterprises, as organics are often termed, produce beneficial outcomes to rural regions in light of conventional agricultural practices and long-term trends? One way to consider those questions is to look at the pattern of change in traditionally farm-dependent regions over the last few decades.

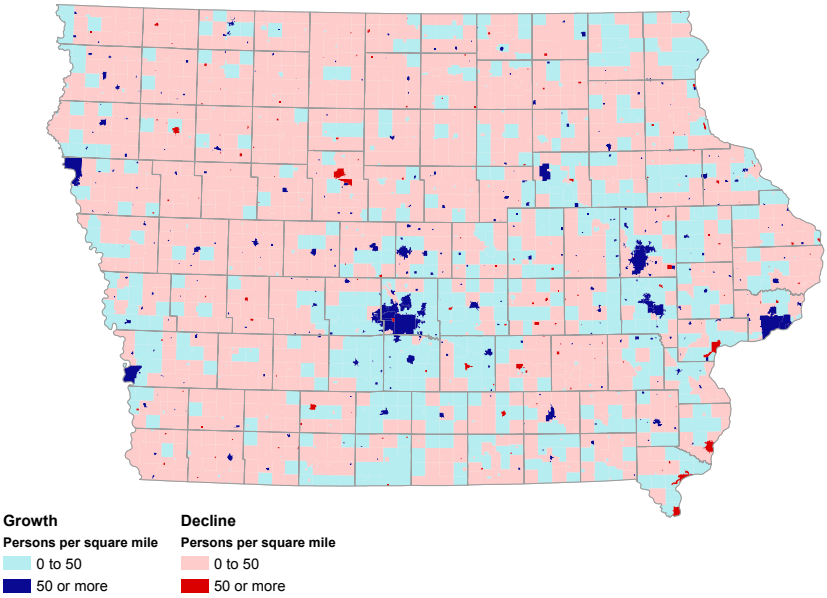
The overall economic vitality of rural, non-metropolitan economies is linked to the fortunes and practices of agriculture, but not entirely dependent on them. Modern rural economies are diverse and contain a very wide array of industrial, service, and production configurations. Still, every county in Iowa maintains a comparatively strong agricultural production component, and the degree to which counties depend on agriculture varies greatly.

Over the past quarter century, there has been a persistent decline in the number of farm operations, the amount of agricultural labor needed, and the trade and service diversity of most small- to medium-sized cities and counties in the state. Increased productivity in the agricultural sector coupled with greater mechanical and chemical inputs have contributed in part to this erosion. The long-term forces of urbanization and their concomitant demands for labor also have contributed to the erosion of social capital in rural communities. The outcomes of these processes are straightforward: persistent out-migration and population declines, reductions in the number of retail and service outlets, a shift towards non-farm employment and higher levels of commuting, and erosions in regional fiscal capacity along with the ability of rural areas to supply public goods.

Figure 1 illustrates the spatial outcomes and the very broad pattern of population erosions in Iowa during the previous decade, when Iowa's overall economy expanded quite strongly. These data are organized at the township and municipal levels, so they are highly detailed. The amount of space across the state showing a net reduction in density (persons per square mile) is immense. The areas of the state realizing strong gains are centered significantly in and within commuting distance of metropolitan areas or, when within predominately declining areas, in just one central community, usually the county seat.

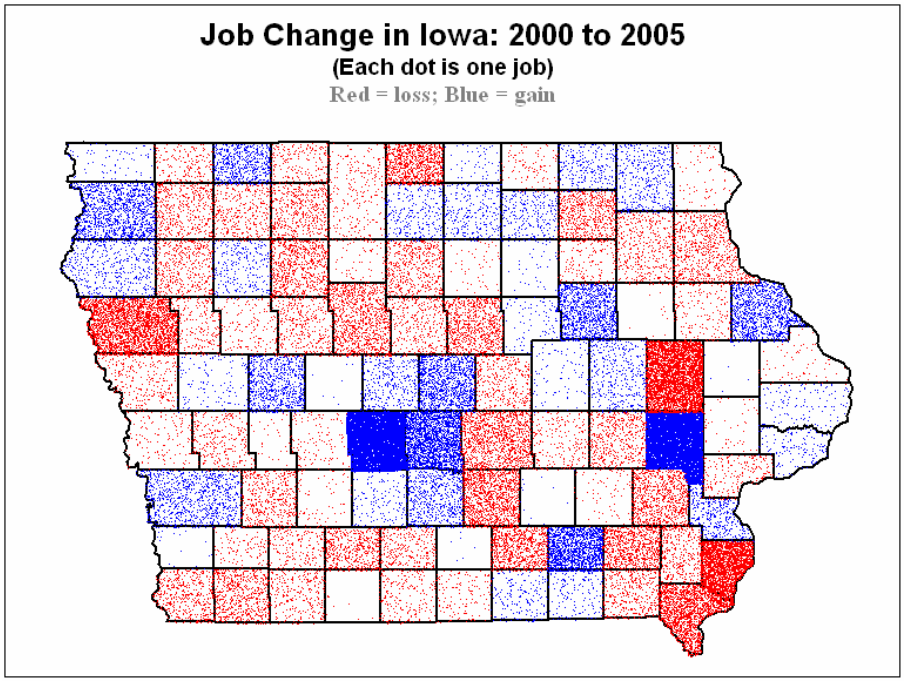
Figure 1

1990-2000 Estimated Change in Population Density



In the current decade, many Iowa rural economies continue to struggle, while other areas of the state are performing better. Figure 2 illustrates at the aggregated county level the pattern and the density of change in job production across Iowa.

Figure 2



Across the northwest quadrant of Iowa, the area where this research is centered and where the ordinance changes have taken place, just a quarter of the counties indicate job gains. Significant erosions are evident in Woodbury County, giving this county strong motivation to enhance both its metropolitan economic health and its rural economic health, as the accompanying table demonstrates. Compared to 1990, the county's shares of jobs, nonfarm proprietors, personal income, aggregate earnings production, and average payments to workers have eroded.

Table 1
Woodbury County Shares of State Totals or Averages

	1990	2000	2004
As Shares of State Totals			
Jobs	3.6%	3.4%	3.2%
Nonfarm proprietors	3.3%	2.6%	2.6%
All Personal Income	3.5%	3.4%	3.1%
Earnings by POW*	3.6%	3.4%	3.1%
Avg. Wage and Salary Per Worker of State Average of 100%	97.4%	95.0%	93.8%

**POW = place of work*

Local governments in Iowa have long been able to leverage property taxes in support of business growth. There are two major mechanisms to achieve this and tax abatements are the first and easiest form. They provide a straightforward reduction in property tax liability for firms meeting specific economic development criteria. The second option is Tax Increment Financing, or TIF. This is an entirely different economic stimulation mechanism that allows communities and counties to redirect all property taxes paid by a qualifying firm or a firm in a qualifying economic development district either to targeted infrastructure and service development to support a firm, or as tax rebates to firms that either meet economic performance criteria or are otherwise categorically eligible for a tax break.

These approaches are among the few cash-like inducements local governments have to offer prospective businesses. A tax break for a limited period of time is viewed desirably by start-up firms as they usually do not generate profits early in their business lives. Similarly, tax breaks can be used to entice desirable types of

development or development into areas that are under-developed or are perceived to be unattractive to certain kinds of businesses.

Historically, tax abatements were provided only to firms that met clear criteria: firms that produced "good" jobs. These firms were usually manufacturing firms, wholesaling and warehousing operations, trucking and inter-modal transport, and regional business headquarters operations. These businesses were favored because they produced products that brought a flow of money into the region – they were considered export-producing industries that stimulated net gains in regional employment. Abatements originally were not provided to retail and local service operations as they generally did not produce net new regional jobs. Qualifications for abatements have loosened considerably over the years, however, and they are applied quite liberally by most city governments.

County governments historically took a back seat to city governments when it came to economic development incentives and planning. In recent years, however, county governments have become more involved in economic development planning, and they have deployed many of the same tools favored by cities in support of county-wide growth. There are two areas of rapid growth in non-municipal areas that counties have addressed: rural, often upscale, housing developments, and ethanol refineries. In both of these instances, counties have used either their tax abatement authority or TIF authority to offer property tax reductions as inducements to growth. The application of county-level tax abatement authority specifically for organic agricultural conversions by Woodbury County is a unique and focused slant on that authority.

A larger question more relevant to the public interest enters into the economic development equation: given the incentive, are citizens of a jurisdiction ultimately made better off as a consequence of the government actions? Will the enhancement to the economy produce net gains in the fiscal accounts and leave the public in a better (or no worse) place than it would have been had the action not been taken? If this is the case, the abatement would be deemed fiscally and socially efficient; if not, the abatement would be considered fiscally and socially inefficient.

Public funds are intended to be used for public purposes. The Code of Iowa allows the promotion of economic activity to qualify as an essential local government purpose. That equates promoting the economy with other important duties of local

governments; namely, the maintenance of the health, safety, and welfare of communities or counties. The implicit promise on the part of policy makers is that the economic enhancement over a reasonable period of time will produce tax revenues (either directly or indirectly) that cover the increments to all public service costs that are associated with the growth and refund the public the up-front forgiven revenues. These public service costs are tangible and direct, such as roads or other public infrastructure required by the benefiting firm. They are tangible and indirect, too, as in the average cost of all non-divisible public goods that are realized by the firm and its workers. Examples are the costs of public safety, local services in support of health and welfare, the administration of justice, maintenance of public records, educating children, and the production and consumption of all other public goods in the area.

The Woodbury County example is the first county government tax abatement plan (county? tax plan?) to address a particular form of agricultural production – in specific, organic production. Modern, conventional crop and animal production in Iowa tends to rely on high levels of equipment and facility investment and, incrementally, less and less labor. Modern agri-businesses attempt to capture economies of scale that produce greater and greater output given all fixed costs.

While scale economies are part and parcel of any agricultural practice, organics production utilizes a different set of production factors that substitute machinery, labor, and energy inputs for chemical inputs. In addition, the research indicates that, overall, organic crop production is much more profitable than conventional crop farming in Iowa. These two factors combined – a mix of different input demands and higher returns to operators – portend net increments to regional economic production.

The Woodbury County Ordinance

According to promotional releases from the Woodbury County Board of Supervisors, its tax abatement policy is designed to bolster organic agricultural production, which in turn will "… help reverse decades of rural population decline due to the growth of large farms typically employed for commodity farming." The logic of the move is that organic production is potentially more profitable and thereby allows younger farmers to participate at a smaller scale than is typically the case in the county. The ordinance has several important components:

- The county is allowing $50,000 in total agricultural land property tax rebates for organic conversion.
- The rebate can be applied to converted land that is used for conventional farming purposes and for dormant land.
- The rebate is for five years, and the recipient must comply with USDA National Organic Program Standards and Regulations.
- The operation must achieve USDA certification after three years.
- If the operation does not achieve certification in the required time, if it deviates from USDA organic standards, or if the land is not farmed, then the county can recover the abated taxes.

The county leaders look to this ordinance to bolster both demographic and economic outcomes in the region. In specific, they argue that this strategy will work to counter the conventional, machine-intensive, labor-shedding production indicative of most agricultural production in the region that resulted in the systematic depopulation of farms and rural communities in the counties. The argument is that the opportunity to earn higher profit margins on less land will entice more small farm operators and help to retain families in the area.

D. Study Design Methods and Materials

This study compares two configurations of crop production to determine the different levels of economic output of each in two hypothetical Woodbury County farming situations. The first assessment is the baseline situation. It looks at a conventional corn-soybean rotation. The second assessment is the organic alternative. It considers a four-crop rotation of corn, soybeans, oats, and alfalfa. We are employing a stylized representative farm approach to this analysis – we are not measuring actual operations.

Comparing the Two Production Scenarios

The production budget information used for this analysis comes from two sources. The costs of conventional corn and soybean farming in Iowa are cited in the Iowa State University Extension report "2006 Iowa Crop Production Cost Budgets (Duffy and Smith)." The costs of the organic alternative are from "Organic Crop Production Enterprise Budgets: 2006 (Chase, Smith, and Delate)." These publications use test farm research results to estimate annual costs of production

for different kinds of crop alternatives. The data are summarized at the per-acre level so they are directly comparable and can be scaled to a study size appropriate to the research question.

The initial data set for the conventional choices contained prices from mid-2006. Those prices actually yielded expected losses to operators. For our analysis, we calculated the break-even price for both corn and soybeans given the cost assumptions built into the enterprise budgets and used those values as amounts to be compared with our organic scenario. All prices for the organic scenarios are those that were listed as of the publication of the budgets. There are, of course, fluctuations of commodity prices over time, and those fluctuations and the durability of changes need to be noted as they influence the differences that will subsequently be reported in this analysis.

Table 2 displays the relevant cost of production information associated with a conventional corn and soybeans (GMO) rotation. The break-even price for corn is $2.59 per bushel and $6.37 for soybeans. Total estimated cost of production is $410 per acre for corn and $318 for soybeans. Given an annual rotation of corn and soybeans, average costs and gross receipts per acre per rotation are $379.

Table 2
Conventional Scenario

	Corn	Soybeans	
	bu	bu	
Price Per Unit	2.59	6.37	
Yield	170	50	
Preharvest fixed	14.00	13.30	
Preharvest variable	184.22	113.61	
Harvest fixed	25.44	11.55	
Harvest variable	46.51	9.78	
Labor cost	10.00	10.00	
Land rent	160.00	160.00	Rotation Average
Total Costs	440.17	318.24	379.21
Gross Receipts	440.30	318.50	379.40

Next, we compare production averages in the conventional system to an organic alternative. This involves a corn, soybeans, oats, and alfalfa rotation (CSOA, hereafter). The data in Table 3 display the CSOA assumptions. The first thing to notice is that organic corn and soybeans fetch much higher prices than their conventional counterparts. Organic corn is nearly $2 higher per bushel, and organic soybeans are more than $7 higher. The second thing to note is that pre-harvest variable costs are lower and labor costs are higher. An organic alternative trades chemical inputs for mechanical and labor inputs. In all, the average costs for corn and soybeans are lower than the conventional alternatives, and the sales value of the crops is significantly higher. The complete rotation also includes a year of organic oats, seeded at the same time with alfalfa. In the third year the farmer harvests the oats and a first cutting of alfalfa. In the fourth year the farmer has the alfalfa cuttings, followed next by a new CSOA rotation. The estimated rotation costs per acre per year are $319, and the average receipts per acre are $511.

Table 3

Organic Scenario

	Organic Corn	Organic Soybeans	Organic Oats	Organic Alfalfa	
	bu	bu	bu / T	T	
Price Per Unit	$4.50	$13.60	$2.30	$90.00	
Yield	170	40	80	5	
Preharvest fixed	$27.90	$26.10	$4.55	$4.55	
Preharvest variable	$120.86	$69.41	$39.68	$39.68	
Harvest fixed	$25.44	$11.15	$32.56	$42.15	
Harvest variable	$46.51	$9.26	$26.35	$37.65	
Labor cost	$14.00	$31.00	$12.00	$15.00	
Land rent	$160.00	$160.00	$160.00	$160.00	Rotation Average
Total Costs	394.71	306.92	275.14	299.03	318.95
Gross Receipts	765.00	544.00	329.00	405.00	510.75
Receipts Over All Costs	370.30	237.08	53.86	105.97	191.80

The CSOA alternative is clearly more profitable than the conventional system using these farm-level statistics, but the overall regional effects of the two systems are not known. An economy is composed of scores of interlinked firms. Returns to one kind of operation might come at the expense of returns to another. In our scenarios, an organic system trades off mechanical and labor inputs for chemical

inputs. So in order to simultaneously measure the effects of higher returns to operators in light of shifting demands for regional inputs, we use an input-output model of the regional economy.

Translating the Enterprise Budgets

The next phase of our research involved translating the enterprise budgets into an accounting framework that aligned with the input-output modeling system. These are found in Table 4 and involved reorganizing the information so that relevant components of industrial production can be itemized clearly. Now, total receipts are translated into a value called total output. Output is composed of all input costs and all value added payments. Value added payments are allocated into labor, returns to proprietors, rental payments, and indirect tax payments to governments.

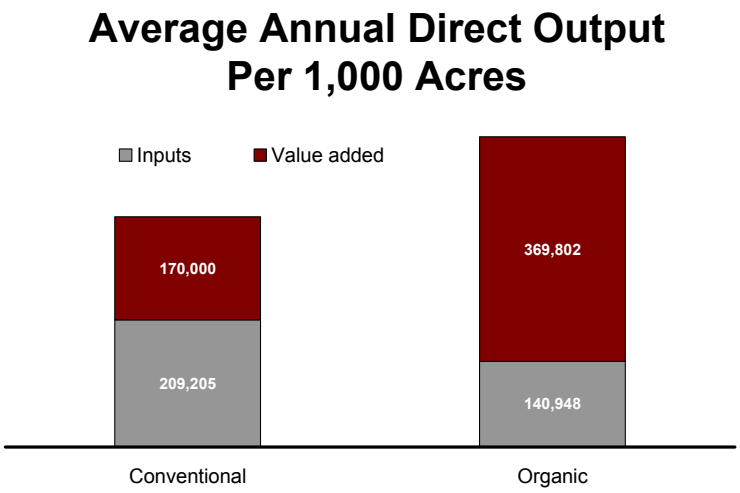
Two additional adjustments were made to these accounts. Fifty percent of the implied rental value in Table 3 is allocated to operator/proprietors and 50 percent to absentee owners. This assumes that the operator/proprietors are receiving some return on their land investment even if the gross receipts and costs are equal. This adjustment in effect makes all of the farms 50 percent owned and 50 percent rented. Next, all other returns over costs are paid as returns to proprietorship to the actual operator. Rents to absentee owners are fixed. The conventional scenario just broke even and received no returns over costs; the organic scenario yielded returns in excess of costs across all categories.

Table 4

	Conventional Scenario		Organic Scenario			
	Corn	Soybeans	Organic Corn	Organic Soybeans	Organic Oats	Organic Alfalfa
Total input costs	270.17	148.24	220.71	115.92	103.14	124.03
plus						
Value added:						
Labor	10.00	10.00	14.00	31.00	12.00	15.00
Proprietorship	74.59	74.59	444.88	311.67	128.45	180.56
Rents	74.59	74.59	74.59	74.59	74.59	74.59
Indirect taxes	10.83	10.83	10.83	10.83	10.83	10.83
Total VA	170.00	170.00	544.30	428.08	225.86	280.97
equals						
Total Output	440.17	318.24	765.00	544.00	329.00	405.00

The next stage in the analysis involved modifying the input-output model to accommodate the scenarios. Two separate models of the Woodbury County economy were made. The first contained the region's traditional corn and oilseeds sectors. Those sectors' accounts were adjusted to reflect the value added characteristics in Table 4. The sum of all input costs was allocated across the default values in the model for these traditional farm operations. A second Woodbury County model was constructed, but the original accounts were modified to reflect the value added characteristics in Table 4 for the organics alternatives. Four separate sectors were compiled for corn, soybeans, oats, and alfalfa. After adjusting the value added characteristics, the intermediate inputs into each sector were modified. All agricultural chemicals links in the sectors were removed and their values were allocated to the farm machinery sector. All remaining non-chemical input amounts were not altered.

Figure 3



Two models, one with a conventional set of accounts and one with an organic set of accounts, were run to gauge the effect of 1,000 acres of production under each scenario. The most obvious difference in the accounting is evident in the total amount of estimated output under the different scenarios (see Figure 3 above). The conventional rotation produces $379,205 in annual output, while the CSOA rotation produces $510,750 annually. The conventional configuration made greater payments to inputs than the organic option, and the organic option made much larger payments to value added.

Economic Impact Modeling Terminology

Both models were stimulated to isolate the value of all economic linkages that would be evident from their respective types of production. Before presenting the findings, it is important to describe the structure of the input-output (I-O) modeling framework.

I-O models allow us to simulate the relationship industries are expected to have with one another in an economy. They also allow us to simulate the relationship households and government institutions have with the economy. The models contain highly detailed estimates of the production characteristics of industries in the area being studied. The modeling process depends heavily on federally compiled statistics relating to industrial structures, wages and salaries, job levels, and the overall production characteristics of up to 509 industries. When a firm changes its level of production by, for example increasing or decreasing its output, the model tracks how all other industries that were linked to the original industry respond.

There are several kinds of data that are either input into the model or otherwise calculated internally and then reported. First are the *direct* values. The direct data refer to the firm that we are studying. Table 4 contains the direct data for which details or summaries were entered into the respective models. All firms require inputs. We call these the *indirect* values. If we know these values, we enter them into our model. If not, we let the default characteristics of firms like the one that we are studying determine the value of inputs. Finally, when workers in the direct industries and workers in the supplying industries convert their pay into household income and, ultimately, household consumption, they *induce* another round of economic activity. All of these values may be combined to achieve the *total* economic value or impact that we are measuring.

Next, we have several economic components that are reported. The first is *industrial output*, which is the value of production in an industry during a measurement period (usually a year). Next is *value added*, which is composed of all payments to workers, sole proprietors, and investors, and as indirect tax payments that are part of the production process. We list *labor income*, which is a subset of value added. Labor income is composed of payments to labor and to sole proprietors. It is a good measure of the income that is expected to be earned in the regional economy. Output, value added, and labor income were all derived

from previous research. The last measure is job levels. We used the number of jobs that would be associated, respectively, with the levels of output that were built into the model under the different sectors. So as organic corn production requires more payments to labor and produces higher output per acre or 1,000 acres, we would get a proportional increase in the number of required jobs compared to the conventional scenario.

C. Data and Discussion

The Economic Impacts

The summary results are compared in Tables 5 and 6. The values represent the annual average returns per rotation. In the case of the conventional system, it is either a two-year annual average, or as if 500 acres were planted in each crop during one year. Under the organic scenario, it is the four-year annual average.

Under the conventional rotation of corn and soybeans, the annual amount of direct output is $379,205. In producing that output (the value of gross sales), 3.5 jobs were required, generating $84,373 in labor income and $169,569 in value added. That level of production required $72,243 in regionally supplied inputs, which in turn called for the near equivalent of another job making $25,755. When the farm jobs and the supply jobs spend their incomes they help to induce $79,250 in output, requiring 1.1 jobs and $26,753 in labor income. The total economic impact, the sum of the preceding values, is $530,698 in industrial output, from which the economy realized $259,669 in total value added, of which $136,881 was paid in labor income to 5.5 jobs. The bottom portion of the table is derived from the top. It simply restates the statistics on a basis of per-$100,000 in direct outputs.

Table 5

Conventional Rotation Annual Economic Impact

Summary Per 1,000 Acres	Direct	Indirect	Induced	Total	Total Multiplier
Output	379,205	72,243	79,250	530,698	1.40
Value Added	169,569	41,898	48,202	259,669	1.53
Labor Income	84,373	25,755	26,753	136,881	1.62
Jobs	3.5	0.9	1.1	5.5	1.55

Summary Per $100,000 in Direct Output	Direct	Indirect	Induced	Total	Total Multiplier
Output	100,000	19,051	20,899	139,950	1.40
Value Added	44,717	11,049	12,711	68,477	1.53
Labor Income	22,250	6,792	7,055	36,097	1.62
Jobs	0.9	0.2	0.3	1.4	1.55

The table also lists multipliers. Multipliers refer to the ratio of total economic activity to direct activity. The multiplier of 1.40 for output means that for every $1 in output, the rest of the economy realized $.40 in output. The labor income multiplier of 1.62 means that for every $1 in labor income in farming, $.62 in labor income is sustained in the rest of the economy. The job multiplier of 1.55 means that for every job in farming in this scenario, 55/100th of a job is supported elsewhere in the regional economy.

Next we scrutinize the organic rotation annual averages. Per 1,000 acres, the organic rotation would generate $510,750 in farm-level output and generate $283,872 in labor income to 4.7 jobs. That level of production would purchase $70,539 in production inputs from the regional economy, calling for the near equivalent of a job making $26,610. When the farm and the supply jobs converted their labor incomes into household spending, they would help induce $224,846 in additional sales in the region, requiring 3 jobs each earning $75,915. In total this alternative produces $806,135 in output, $546,323 in value added, of which $386,397 is paid as labor income to 8.5 jobs. As before, the values also are expressed on a per-$100,000 of output basis.

Table 6

Organic Rotation Annual Economic Impact

Summary Per 1,000 Acres	Direct	Indirect	Induced	Total	Total Multiplier
Output	510,750	70,539	224,846	806,135	1.58
Value Added	366,452	43,102	136,769	546,323	1.49
Labor Income	283,872	26,610	75,915	386,397	1.36
Jobs	4.7	0.9	3.0	8.5	1.83

Summary Per $100,000 in Direct Output	Direct	Indirect	Induced	Total	Total Multiplier
Output	100,000	13,811	44,023	157,834	1.58
Value Added	71,748	8,439	26,778	106,965	1.49
Labor Income	55,579	5,210	14,864	75,653	1.36
Jobs	0.9	0.2	0.6	1.7	1.83

The organic rotation has higher output and job multipliers; the conventional rotation has higher value added and income multipliers. The difference in total economic impact, however, is stark: the organic rotation produces 52 percent more output economic impact than the conventional option, 110 percent more value added, 182 percent more labor income, and 56 percent more jobs from the same 1,000 acres of production. Measured on a per-$100,000 in sales basis, the organic option produced 13 percent more total output, 56 percent more value added, 110 percent more labor income, and 16 percent more jobs.

As we tend to think more readily in terms of labor incomes, the display in Figure 4 demonstrates the differences in the two systems. First, as is clearly obvious, the organic rotation produces much more labor income. A higher portion accrues to farm labor, and a much higher portion accumulates to the farmer-operator than in the conventional rotation. The total indirect labor incomes are relatively similar, but the amount of regional labor income that is induced is far greater. It is higher because the additional direct income is very likely to be re-spent in the regional economy; thus it stimulates more local jobs that serve households.

Figure 4

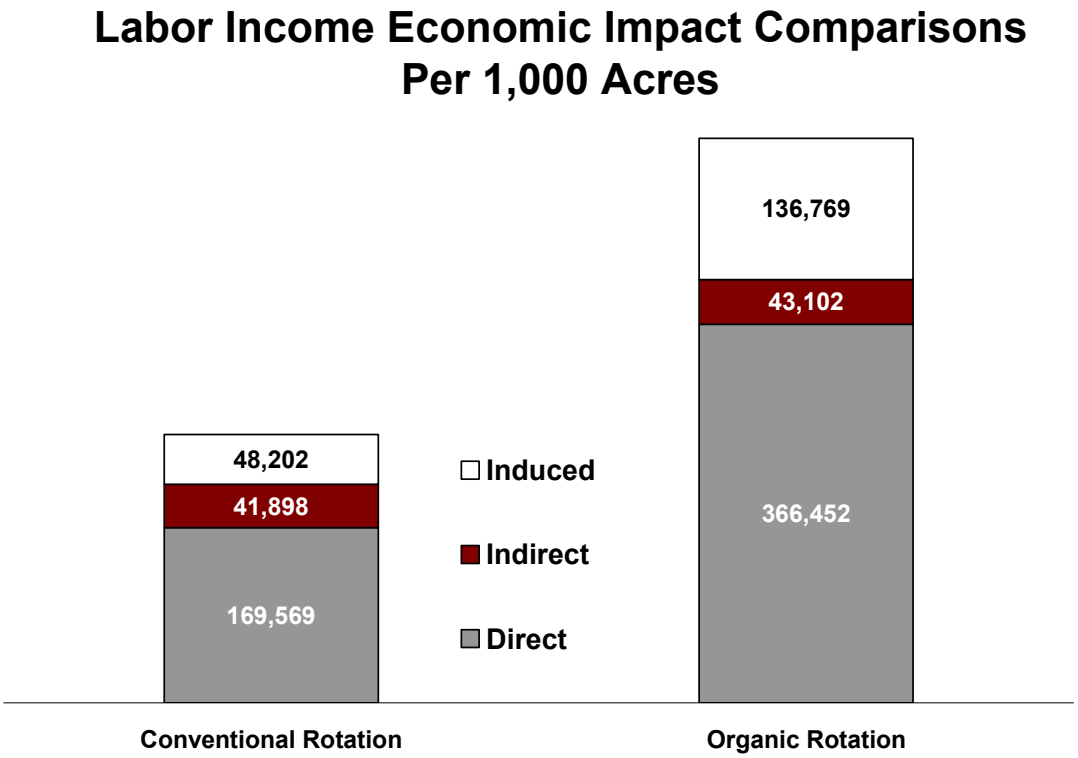
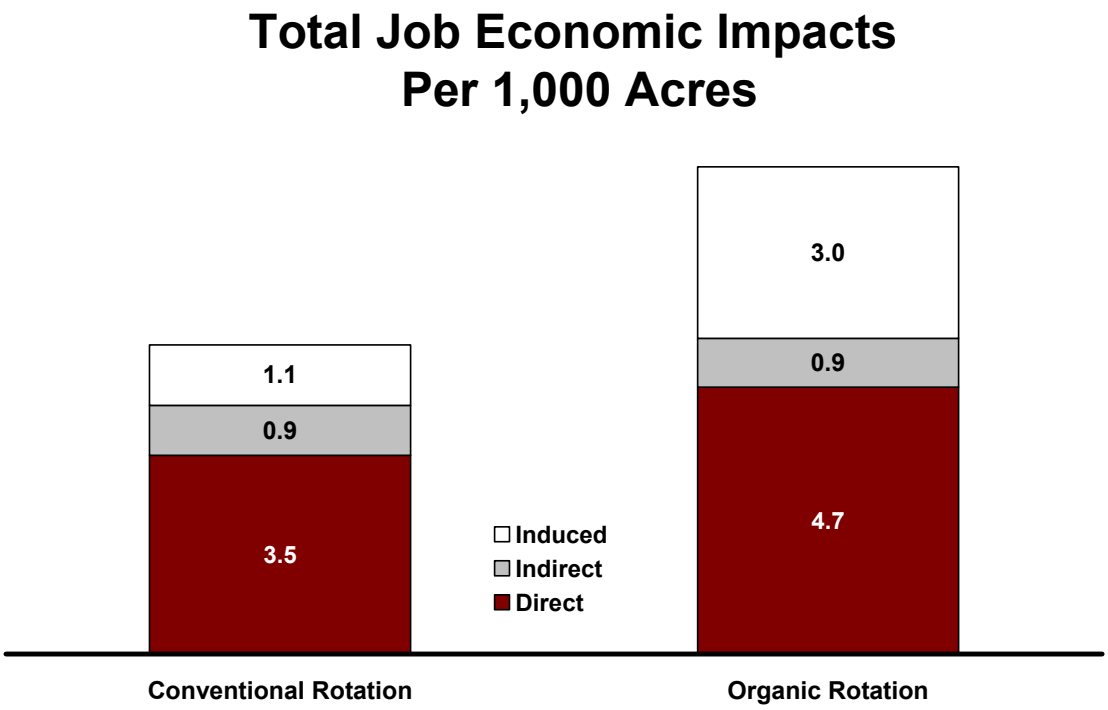


Figure 5 displays the different type of job effects per rotation. Initially, the organic alternative requires more direct jobs on the farm. They both require similar input jobs, but the organic alternative produces significantly more induced jobs. The reason, again, is because of the higher labor incomes that are generated on the farm; labor incomes that are spent in the area economy.

Figure 5



Fiscal Impacts

We have demonstrated that potential exists for superior area economic impacts under the organic alternative. In this section we investigate the efficacy of the property tax abatement. There is an underlying and essential assumption to the use of property tax incentives to stimulate economic changes: over a reasonable period of time, society's welfare will be enhanced as a result. Society's welfare improves when undesirable economic or social conditions are abated or, more basically, when all of the property taxes are paid back and the abatement proves to be an efficient allocation of public resources. The question, at the most basic level, is whether this program will yield net gains in regional fiscal accounts over a reasonable period of time. If it does, society is better off from a fiscal standpoint. If it does not, then at least from a fiscal standpoint, society is no better off and the program is inefficient.

For our purposes, we need to determine several things.

- First, the expected tax rebates given our study assumption of 1,000 acres.
- Next, we need to get a handle on the average contribution to property tax payments given the region's income.
- We need to compare the difference in expected property taxes that are generated in the economy given the two cropping alternatives and their overall economic impacts.
- Finally, we need to compare that value with the rebate amount to see if the economy is recovering the forgiven taxes.

All of the necessary factors for dealing with these needs are contained in Table 7. Fiscal 2006 agricultural land property tax rates in the rural portions of Woodbury County were $25.935 per $1,000 of taxable ag land valuation. The average taxable value of crop land per acre was $573. Agricultural land taxable values differ strongly from the market value of land. Ag land is taxed according to its suitability for producing corn. Land with high suitability has a higher taxable value than land with a low suitability. The expected property taxes that would have been collected on 1,000 acres of crop land would be $14,862. Reducing the amount of potential property tax abatement by 5 percent takes into account any school property tax levies or general obligation debt service payments that might apply to the county as these may not be abated. The resulting value is $14,119. So given that assumption, the county tax program could abate 3,541 acres of crop land for organic production.

Next, we need an estimate of average non-agricultural property taxes paid in the county relative to all non-agricultural income. This value becomes our expected property tax payment on earnings. The two-fold reason for excluding agricultural property taxes from this assessment: (1) expected property tax payments already are factored into the modeling system as a cost of doing business; accordingly, those taxes are collected on a pre-income basis; (2) under Iowa's property taxation system for agricultural land, there is no reason to believe that the corn suitability rating would change for an organic operation as compared to a conventional operation. <u>Hence, there would be absolutely no difference between the two alternatives in ag land property tax payments. All property tax differences occur off the farm.</u>

We arrive at those values by using U.S. Bureau of Economic Analysis compilations of total non-agricultural personal income and all non-agricultural (land and building)

property taxes generated in Woodbury County. That yields an expected value of 3.17 percent of personal income being directed to area property taxes. Next we multiply the total labor income economic impact in Table 6 times that percentage and the total labor income economic impact in Table 5 as well.* The difference between the two is $7,918. The bump in regional economic activity attributable to the organic alternative would stimulate $7,918 more property taxes in the region.

Table 7
Fiscal Factors and Assumptions

Weighted average rural agricultural land property tax rate per $1,000 of taxable valuation[1.]	$	25.935
Weighted average crop agricultural land taxable value per acre.[2.]	$	573
Expected ag-land property taxes on 1,000 acres	$	14,862
Expected ag-land property rebates on 1,000 acres after adjusting for non-abateble levies.[3.]	$	14,119
All non-agricultural property taxes as a percentage of all non-agricultural personal income -- 2006		3.17%
Expected non-ag land property taxes under the organic alternative rotation	$	12,261.30
Minus: Expected non-ag land property taxes under the conventional rotation	$	4,343.56
Equals: Annual gain in regional property taxes	$	7,917.73
Difference between abatement and gain	$	(6,201)

1. Rates for all rural land property taxes from Iowa Department of Management taxable valuation by taxing district summaries.

2. Average taxable Woodbury County ag land values for fiscal 2006 were $527 per acre. According to the 2002 agricultural census, 85 percent of all land in farms was cropland. For this study, cropland was assigned a corn suitability rating twice as high, on average, as non-cropland yielding the weighted average value per acre that is displayed.

3. Portions of school levies and county general obligation debt service cannot be abated.

* For purposes of simplicity, we assume that all of the economic impact incomes stay in Woodbury County. The modeling system measures where the incomes are made, not where they may ultimately be realized. As Woodbury County is a regional trade center, there is a large amount of in-commuting, and a substantial fraction of incomes generated in Woodbury County are realized as personal income in other counties.

Finally, we have the comparison between the abatement value and the rise in property tax receipts. That leaves us with a net annual deficit of $6,201. Were the county to abate 1,000 acres of ag land for five years and assuming that these values stay the same after adjusting for inflation, the county would abate $70,595 in property taxes while it would through economic development gains see $35,590 in property taxes for a seeming gap of nearly $35,000. One might be tempted to argue that five years after the abatement ends the county would break even and start accumulating net gains in property taxes.

That would be a fallacious assumption. Property taxes are generated in response to real demands for public goods and services by citizens. Stated differently, the property taxes that are generated as a result of income and job gains would be consumed by city, county, and schools as they provided necessary goods and services to the households that were sustained by the economic impact. So the net gain in property taxes after discounting the incremental costs of public services is what must be compared over time.

A net gain in property taxes for the region can occur if the overall average compensation in the stimulated sectors exceeds the regional average. Stated more clearly: better jobs with higher incomes tend to contribute to surplus fiscal accounts and help offset the lower ability to pay for public goods and services among lower paid workers. Overall, the average weighted compensation per all impacted jobs under the organic alternative ($44,500) appears to be a third higher than the county average ($33,500), so a propensity to generate some net gains in the fiscal accounts may be evident. Nearly all of that advantage is accumulating to the owner-operator of the organic operation, however, and is not distributed broadly in the economy: earnings payments to all other labor on the organic farm, to the indirect jobs, and to the induced jobs are substantially lower than the regional average earnings per job (around $26,000). Out of the 8.5 total job effects measured, one job (that of the operator), is generating very high returns, and 7.5 jobs are not. Were we to look at the median workers' earnings, we would conclude that the prospects, over time, of the county recovering the abatements and ultimately enhancing the region's net welfare are reasonably low.

Net welfare here is simply measured as not increasing average property taxes for all other citizens as a result of the abatement or, in economic terms, not making others worse off as a consequence of the policy decision. If residents and local officials desire to define net welfare gains differently, they are free to do so. They

will be hard-pressed, however, to demonstrate that the region's net fiscal condition has been improved by the program.

D. Summary and Recommendations

As measured in this study, an organic alternative initially generates higher returns per acre or, potentially, per operation than conventional corn and soybean farming. When the differences in the components of production inputs are entered into a modeling system and allowed to interact with the regional economy, and compared on a standard basis, the organic production alternative generated significantly greater levels of regional product (value added), payments to workers, and area jobs.

If organic returns per acre or per similar-sized farm are demonstrably superior to those of conventional farming, why are there not more organic farmers, all public subsidies notwithstanding? Although answering this question is beyond the objectives of this study, we offer some observations as to why more farmers do not transition to organic.

First, the benefits of conventional farming may extend beyond the farm. Stated more simply, conventional operators may be able to tap into other earnings opportunities given the generally lower labor and time needs and higher use of mechanical and chemical inputs.

Second, the physical labor and time commitments necessary for organic operations are substantial and may be a disincentive not reflected in the returns to operation statistics. Accordingly, there may be large earnings opportunity costs that mitigate against this option given their additional time and labor requirements.

Third, organic operations may entail actual or perceived added risks, either on the crop production side because of the absence of chemical mitigation in the event of pests or other problems or in terms of the average prices paid for organic products.

And last, the vast preponderance of farmers and persons accultured to farming have been provided with decades of experiences and incentives that do not favor organic production. Again, these points are observations; we are not able to document them through this research.

The next issue concerns the use of public resources to promote one kind of enterprise over another. With public resources, there should be no value judgment that favors one kind of acceptable private enterprise over another. The public does not have a stake in the success or failure of a particular business, provided that business follows society's rules. To offer differential incentives for one type of business over another, one must have either strong economic justification or a strong social agenda considered legitimate by the public.

Larger scale organic production can yield positive impacts on soil erosion, groundwater, and overall soil tilth, all of which are difficult to measure in economic terms. Still, as demonstrated here, the conversion of conventional farming to an organic alternative can generate greater area economic impacts, and potentially, gains in the number of rural households.

Were the entire $50,000 allocated as incentives, that would subsidize the conversion of 3,541 acres of Woodbury County cropland in the current fiscal year. Multiplying the difference in job values (Table 6 minus Table 5) by 3.541 (as our research was conducted on a per 1,000 acre basis) gives an organic impact potential of 10.8 jobs from this alternative. The 3,541 benefited acres potentially converted from the program would constitute less than 1 percent of the crop land in the county. The program will not substantially alter the job picture in the county or the amount of land farmed in sustainable ways.

Our research results question the public efficacy of this tax abatement program, the strong gains to the regional economy notwithstanding. We have a situation where market cues should be driving a shift to organic farming, but they are not. And we have a situation where public incentives are applied to address an issue that the market has not, for reasons unknown.

It is a legitimate function of local government to address areas where the market is failing. The reluctance of farmers to adopt organic alternatives is, however, not a market failure. It might be a behavioral failure, it might be a cultural failure, and it might be a knowledge failure. The justification for the use of public money to redress these issues cannot be made, however, using traditional economic efficiency measures.

E. Impact of the Results

The findings of this research affirm that returns to operators choosing organic methods are greater than returns to operators that use conventional means. On an economic impact basis, this research demonstrates in Iowa for the first time that higher returns to operators under an organic scenario have economic impact effects in the region that are superior to the conventional farming alternative. These findings can be used to help make the case for the positive promotion of organic conversion in Iowa as a clear and convincing component of rural and regional economic development

The findings also demonstrate that the use of property tax abatements regarding this promotion are likely to be inefficient: it is unlikely that the county will recover the forgone property taxes used to promote this program over a reasonable period of time. Accordingly, public costs (county property tax burdens) are shifted to persons who do not directly or indirectly benefit from the program.

To date, two Iowa counties have passed these ordinances. The findings of this research indicate that the overall justification for an organics conversion program using property taxes as a partial inducement has to be made using non-economic criteria.

F. Outreach and Information Transfer

Publications

Upon review and evaluation, the authors will seek to find a publication source for this work.

Education and Outreach

- To date, three presentations have been made regarding this research. Preliminary findings were shared in early November, 2006, at the Woodbury County Organic Growers Conference.
- A presentation was also made at the Leopold Center Marketing and Food Systems Workshop November 6, 2006.
- Those presentations stimulated participation on February, 10, 2007 with a workshop on the research at the Warren County Niche Marketing Conference, hosted by the Warren County Farm Bureau Rural Vitality Committee.

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