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ABSTRACT---
Environmental and social justifications for organic conversion subsidies are as pervasive in the United States as in Europe, but national policy does not explicitly support organic agriculture. Using Sweden's experience, we analyze factors that affect whether a subsidy is required to motivate organic conversion. We use a utility difference model to compare farmers who converted before and after the subsidy. Significant factors in organic conversion without subsidies are greater livestock diversity and more sales outlets. Farmers requiring subsidies manage larger farms, are more concerned with organic inspection quality and adequacy of technical advice, and reside in areas with more organic farms. Results suggest that a subsidy induces mainly those already inclined toward organic agriculture to convert. Limited exposure to organic systems and a marketing and technical information infrastructure designed to support conventional agriculture restrict the potential effect of a conversion subsidy in the United States.

-----KEY WORDS-----

organic agriculture, utility difference model, public policy

Conversion Subsidies for Organic Production:

Results From Sweden and Lessons for the United States

Organic agricultural policy is increasing in importance in both the U.S. and Europe. In the U.S., the 1990 Food, Agriculture, Conservation and Trade Act established a National Organic Standards Board to develop standards to govern the production, processing and labeling of organically produced foods (Center for Resource Economics, 1991). European countries have moved beyond voluntary certification to establish organic conversion and production supports (Holden, 1993). Governments in Europe have recognized that both food quality and environmental factors motivate interest in organic agriculture among consumers and producers (Dlouhý, 1989). Direct payment programs demonstrate recognition of the social benefits of organic agriculture.

Lampkin and Padel (1994) summarized financial support programs from 1987 to 1992 in Denmark, Sweden, Norway, Finland, Switzerland, Austria and Germany. Most of these subsidies were of limited term (up to three years during conversion), but required complete conversion of at least a portion of the farm and continued organic production following the termination of the payment period. The policies were justified by environmental protection and surplus output reduction goals. With emphasis on soil management, prohibition of synthetically derived chemicals, and mechanical and cultural pest control practices, organic agriculture has potential for environmental enhancement. Policies such as taxation and regulation targeted to alter specific practices and chemical use cannot accomplish the broader improvements that are possible with proactive conversion to safer systems.

The United States has used agricultural subsidies to support farm income and increase yields. Environmental subsidies and taxes have been practice- or input-specific. Increasing reliance on market signals in making production decisions was codified in the latest federal agricultural

legislation, which established phase out periods for most direct subsidy programs. Even as markets for American organic products expand, barriers to conversion persist, especially in the form of limited research and extension services, information-gathering costs and conversion-related investments. In the period required to attain organic certification, usually three years, farmers are legally barred from labeling their output as "organic" and may fail to realize price premiums. The environmental and social justifications for conversion subsidies are as pervasive in the United States as in Europe, but even politically acceptable cost-sharing programs must be cost-effective in terms of marginal conversion to organic production.

Sweden offers a case study to examine the effect of a subsidy to stimulate conversion to organic production practices. In 1989, a terminal subsidy for one to three years was provided to 1,781 farmers who agreed to follow the national certification agency's regulations for at least six years (Svensson, 1991). More than half of the farmers surveyed had converted or had begun conversion to organic methods before 1989. Thus, for a relatively large share of farmers, the subsidy was not necessary to induce conversion. We analyze factors that determine under what conditions subsidies are required to motivate organic conversion. We use a utility maximization model to compare farmers who converted after the subsidy was available with those who converted before. Policy implications for conversion support in the United States are drawn from the model results.

Agricultural Policy in Sweden

In 1991, there were 94,000 farms of two hectares or more, with 30,000 enterprises where most of the income was derived from farming (Federation of Swedish Farmers, 1992). In addition, there were 15,000 to 20,000 commercial farmers where the farmer obtained considerable income from off-farm employment. The average holding was 30 hectares, with arable land totaling about 2.8

million hectares in 1991. About two percent of the working population was engaged in farming, with more than 50 percent of farmers older than 50 years. Crop production was the main enterprise on 15,600 holdings, while 40,500 farms practice animal husbandry.

Agricultural policy and development of the agricultural sector play an important role in Scandinavian countries, extending beyond the direct impact on gross national product. Petersson (1993, p. 197) noted the "exceptional place of agriculture in the culture and consciousness of the people," with most Swedes maintaining contact with farming directly or through relatives. Policy adjustments within the agricultural sector have supported diversified family farms and viable rural communities. The strength of farmers' cooperatives and labor unions has given farmers some control over input and processing industries. These factors have created a distinct sense of responsibility for farming practices.

In 1985, Swedish agricultural policy for the first time included a goal dealing with environment and resources (Kumm, 1991). This policy implied that agriculture and food production must respect environmental quality and recognize the need for sustainable use of natural resources. To reduce production and pay for exports of surplus, price regulation charges were applied to fertilizers in 1982 and to pesticides in 1986. In addition, an input tax of five percent of the price of fertilizers and pesticides was introduced in 1984. Funds from the tax support research on reducing and eliminating chemicals in agricultural production and help pay for conservation and extension education efforts. Altogether the charges and taxes represent about 20 percent of the price of fertilizer (Kumm, 1991). The policy aim was to halve pesticide use from the 1990 levels by 1995 (Federation of Swedish Farmers, 1992).

In 1985, a number of organizations committed to organic agriculture founded KRAV, the main Swedish national organic certification agency (KRAV, 1992).[1] Government grants provided startup funds in 1988, but support now derives from producer fees for inspection and membership. KRAV is independent of government and grower control, except for union and cooperative membership on the general assembly that oversees operations. KRAV certifies arable and horticultural production, livestock husbandry, food processing and manufacturing, marketing, retailing, wild growing production such as berries harvested from woods, and imported produce (KRAV, 1992).

Thus, agricultural policy in Sweden has favored shifts toward reduced and no-chemical agriculture. In the United States, chemical taxation for environmental purposes has been implemented only at the state level (Center for Science in the Public Interest, 1995). Organic certification has been offered through a myriad of independent, grower-based and state organizations. Despite lack of unified policies, at least 54,900 hectares were certified as organic in 1995, with an average of 68 hectares rented or leased by 322 farmers and an average of 46 hectares owned by 714 farmers responding to a survey by the Organic Farming Research Foundation [OFRF] (OFRF, 1996). This compares to 38,940 hectares, with an average of 68 hectares rented or leased by 222 farmers and an average of 54 hectares owned by 440 farmers responding to the same survey in 1993 (OFRF, 1993). This is 41 percent growth in certified acreage over two years. Certifying agencies in California, Florida, Idaho, Wisconsin and Texas reported that organic vegetable acreage increased by 10 to 272 percent, or an average of 47 percent across the five states between 1993 and 1996, representing 1.5 percent of all vegetable acreage in those states in 1995 (Greene and Calvin, 1997).

The potential limit of organic expansion in the absence of a subsidy is unknown. European experience indicates that conversion subsidies can increase the organic farming sector by 300 percent (Lampkin and Padel, 1994). Of relevance is what factors in the farmer's utility function make a subsidy necessary before conversion is begun. Stated another way, by identifying what factors explain conversion in the absence of a subsidy, we can suggest whether conditions in the United States warrant financial assistance for conversion. We first explore the economic effects farmers experience during the transition to organic farming.

Economics of Transition

Transition effects are penalties in yield or cost due to agroecosystem adjustments and management inefficiencies while learning new practices. The time required to make these one-time adjustments is referred to as the transition period (National Research Council, 1989). The most important financial constraints during conversion are lack of access to premium prices until conversion is complete, conversion-related investments and disinvestments and information-gathering costs (Padel and Lampkin, 1994). The legal transition to organic agriculture is commonly set at three years in the United States and one to two years in Europe, requiring on-farm inspections and record keeping. After the legal transition period is finished, the farmer may obtain price premiums for certified organic products, which helps offset the physical transition costs. The physical transition to organic farming depends on the crop, farmer experience and circumstances of the farm. The physical transition period is completed when yields and costs achieve a dynamic equilibrium.

Management cost penalties may be reduced by farmer education about organic practices, but sources of information may be limited. Most organic farmers use a variety of sources to learn about new practices. Transition costs related to management and yield penalties constitute the main reasons

for lack of conversion to sustainable farming in the United States (U.S. General Accounting Office, 1990). One of the reasons for the Swedish subsidy program was to overcome these factors among farmers who had not already converted to organic methods.

By distinguishing between those who required a subsidy to convert and those who did not, we can evaluate what factors may serve as policy variables in encouraging transition. The model described in the next section accounts for the subsidy's effect on conversion.

Effect of Conversion Subsidy

Following Hanemann (1984), the observed yes/no decision to require the subsidy for conversion to organic methods is viewed as the outcome of a utility maximizing choice by the farmer. The indirect utility function for each farmer, V_j, depends on the subsidy offered, which differs across counties, income and other behavioral characteristics and institutional factors that affect decisions on agricultural practices. The subsidy will be required only if

$$V_j(1, \text{Inc}_j + A_j; S_j) + \epsilon_{j1} > V_j(0, \text{Inc}_j; S_j) + \epsilon_{j0} \quad . \qquad \textbf{(1)}$$

For individual j, the indirect utility when conversion is due to the subsidy is designated with 1 and is compared to the indirect utility when conversion to organic methods is not related to the subsidy, designated with 0.

The individual's preferences are influenced only by income, Inc_j, and other observable attributes, S_j, when he or she is not motivated by the subsidy. The offered subsidy, A_j, is added to the farmer's income when a payment is required to induce conversion. Random factors that influence the respondent's indirect utility function are defined by ϵ_{j0} and ϵ_{j1}, which are independent and identically distributed random variables with zero means.

If the difference between these two utility functions is greater than zero, the subsidy payment is needed to induce the farmer to convert. The utility difference model from this specification is

$$\Delta V_j = \alpha\, f(A_j\,,\, S_j) + \epsilon_j^* \qquad \textbf{(2)}$$

where *f(.)* denotes the functional form that depends on observed explanatory variables and a vector of estimated parameters α. Base income is the same with or without the subsidy. The unobserved factors that influence whether a subsidy is required for conversion are represented by ϵ_j^*, which is the difference in the error terms of the indirect utility functions defined as $\epsilon_{j1} - \epsilon_{j0}$.

The utility difference model yields the probit specification when the probability of the subsidy requirement is specified as the cumulative distribution function of a standard normal variable

$$\text{Prob}(\text{Yes}) = F_{\epsilon_j^*}(\Delta \mathbf{V}) \qquad . \qquad \textbf{(3)}$$

By incorporating noneconomic and economic variables in the specification, we may test which factors influence the requirement of a conversion subsidy.

Data and Hypotheses

In 1990, a survey questionnaire was sent to 1,781 farmers who accepted the 1989 subsidy for organic conversion, with a response rate of 41 percent. After excluding observations missing data for key variables, we had a sample 550, of whom 234 converted after the subsidy was offered. The questionnaire, which differentiated respondents by year of conversion, asked farmers about farm size characteristics, changes in livestock and crop production since converting to organic, sources of information about organic production, reasons for conversion, outlets for sale of organic products and perception of organic inspection quality, among other things.

Using data in the survey and data collected at the län (county) level, we tested several hypotheses related to factors that affect necessity of subsidy for conversion. Ease of conversion is

a major determinant of converting to organic agriculture without a subsidy. While there is no one indicator of ease of conversion, economic theory suggests that those with the lowest marginal costs of conversion, or the highest marginal benefits (for example, from lifestyle choices) would have converted before the availability of the subsidy. Certain factors make a subsidy requirement more likely.

The amount of the subsidy should be important if farmers respond to the incentive to convert. Differential payments were offered across läns, with eligibility for up to three years depending on land quality, yield potential and land use. The subsidy was payable for only one year on grassland and green manure crops, and was not payable on horticultural crops. Payments ranged from SEK 700 to SEK 2,900 per hectare per year across 24 läns. Farms had to be registered in 1989 to be eligible, but conversion could begin through 1992. Organic practices consistent with KRAV regulations had to be continued for six years. Payment level should be positively related to the requirement for a conversion subsidy.

Farm size, measured in acreage, has been shown to be inversely related to both organic certification and lack of certification (Cook, 1988). However, for farms with diverse enterprises that have mixed acreage (some in organic, some in nonorganic), the relationship between farm size and certification is positive. Cook (1988) suggested that management changes and differences in input mix required for organic production might be scale dependent, so that the mixed farm has some advantage in allocation of resources. Padel and Lampkin (1994) noted the same inconsistency in scale results across countries, attributing the conflicting results to longevity of organic farming traditions within the country. They commented that average organic farm size is increasing in countries with organic sectors dominated by small farms. This may be part of a general trend toward

extensification of agriculture. If larger farms are more commercially oriented, then increased farm size should correlate positively with a subsidy requirement for conversion to organic farming.

The National Research Council (1989) stressed the importance of combined crop-livestock operations in achieving a sustainable system. Kumm (1991) noted the declining proportion of farms with livestock and leys (pastures) in Sweden. According to the Federation of Swedish Farmers (1992), only eight percent of farms have "mixed farming" as their main production system. Farms that have a diverse crop and livestock mix would be in a better position to convert to organic production without a subsidy, so diversity is expected to be negatively correlated with a subsidy requirement.

Information and technical assistance are key factors in reducing the management costs of the transition period. Farmers in Sweden have a variety of information sources, including state, local and private farm advisors, organic inspection officials, other farmers, written materials and study circles, in which farmers meet weekly over a fixed term for guided discussion of agricultural issues. Farmers might use a single source intensively or obtain information from a variety of sources. Adequacy of technical and economic advice on conversion reduces the risk of financially or environmentally costly management errors. As Padel and Lampkin (1994) pointed out, direct costs of information and experience gathering constitute major barriers to organic conversion, suggesting that both access to and adequacy of information should be positively related to a subsidy requirement.

Satisfaction with certifying agencies should be positively related to conversion, though the relationship to a subsidy requirement is unclear. When the inspection quality is good, farmers considering conversion have greater faith in the ability of the certification system to detect cheating, so the cost of certification is compensated by consumer confidence and price premiums. Consumers

are willing to pay more for certified products only if there is assurance that organic standards have been met in production and processing (Lampkin and Padel, 1994).

Availability of outlets for certified organic products should be negatively related to the subsidy requirement for conversion. Cook (1988) showed that market availability is critical, and that market niches may be expensive to establish and maintain. In surveys of U.S. organic farmers, the OFRF (1993, 1996) has documented growers' prioritization of market development. Certified outlets permit growers to obtain the price premium that helps offset organic production costs. In Sweden, there are several outlets for organic foods, including organic farmers' cooperatives, saltå mill, growers' cooperatives, kommun (local council), ICA or KF (grocery distributors), local shops, farm shops and other outlets. Farmers who have access to multiple markets would have a better chance of selling their organic product at premium prices, and would not be as reliant on a subsidy.

Social pressure from other farmers and passive awareness of organic operations should positively affect the decision to convert, even without a subsidy. If relatively more farmers in a län are producing organically, then nonorganic producers are able to observe successful practices, and feel reassured that organic systems are feasible in their locale. Lampkin and Padel (1994) recognized that existing organic farmers are an important source of information and expertise for farmers converting. The more organic farmers in a län, the more potential for networking, and the less likely that a subsidy is required to induce farmers to convert.

Padel and Lampkin (1994) noted that noneconomic factors such as husbandry concerns, personal considerations and political, ideological, philosophical and religious perspectives may influence the conversion decision. They theorized that early adopters of organic systems tend to be different from the farming community as a whole to the extent that their noneconomic concerns

contribute significantly to their utility, perhaps enough to offset adverse economic effects of early adoption. Among nonfinancial reasons for conversion Swedish organic farmers list are enjoyment of the farming system, consistency with anthroposophy, environmental and human health protection, enhanced food quality, ergonometric advantages and longtime experience with organic systems. Noneconomic factors should be negatively correlated with the subsidy requirement if the early adopters who did not require a subsidy are statistically different from later adopters.

Empirical Results

Based on the hypotheses presented, the specification of the indirect utility function is

$$\Delta V = \alpha_0 + \alpha_1 \text{Paymt} + \alpha_2 \text{ArabAcr} + \alpha_3 \text{AnimDiv} + \alpha_4 \text{SourcTot} + \alpha_5 \text{AdeqHelp} + \alpha_6 \text{InspQual} + \alpha_7 \text{SellTot} + \alpha_8 \text{NrOrg88} + \alpha_9 \text{NonEcon} + \epsilon_j^* \quad . \tag{4}$$

The variable Paymt represents A_j from equation 2 and all other variables are elements of the vector S_j. Table 1 describes the data used and variables estimated. The dependent variable, Effect, in the probit model is the probability that a farmer required a subsidy to convert to organic agriculture. This variable was constructed from the intersection of those who had not converted as of 1989, the date of the subsidy program, and those who said the subsidy had a substantial influence on their decision to convert. Twenty-seven percent (147 farmers) in the sample met this definition. Table 2 shows the maximum likelihood estimates of the probit model in equation 4.

The subsidy payment (Paymt) was significant and positively related to the need for a conversion inducement. The average payment was SEK 1,743 per hectare, although the entire range from SEK 700 to SEK 2,900 was represented in the sample. Farm size (ArabAcr) also was significant and positively related to the probability of the subsidy being required for conversion. Average farm size was 35 hectares, but the full range from 5 ha to 200 ha was included in the sample.

This implies that larger farms were more likely not to have converted on their own. These results suggest that smaller farmers who might have dominated the sector will face more competition from larger farms when a conversion subsidy is instituted.

Diversity of enterprises was measured by number of six livestock types present on the farm prior to conversion, quantified by the AnimDiv variable. The average for all farms in the sample was 1.7, with a range from zero to six. Livestock diversity was significant and negatively correlated with probability of a subsidy requirement. The important role of livestock in nutrient cycling, converting pasture and pests to animal products and producing manure for crop nutrients on organic farms may account for a cost-reducing effect in conversion as animal diversity increases. This would ease transition to organic production even in the absence of a subsidy.

The variable (SourcTot) counts the number of sources that the respondent consulted when seeking advice on organic farming, from one to eight possible sources. The adequacy of the technical and economic advice (AdeqHelp) provided for converting to organic methods was measured by an self-reported indicator, assigned a value of 1 if sufficient advice was available. SourcTot was not significant, but AdeqHelp was positive and significant. Adequacy of information increases the probability of farmers requiring a subsidy to convert. These farmers may have lacked the confidence to proceed without outside support in the form of technical assistance. On a percentage basis, most farmers in the sample consulted books and periodicals (55 percent), while other choices were state advisors (38 percent), local advisors (28 percent), other farmers (25 percent), certification officials (20 percent), study circles (12 percent) and other farm advisors (4 percent). Thus, diversity of sources may be less important than types of sources consulted. The average number of sources consulted was 1.9, but the maximum consulted was only four of the possible eight. About 79 percent

of the sample felt technical and economic advice on conversion was adequate, which may be a function of the sources they selected. Lack of significance on SourcTot indicates that all converters find availability of information sources important in their decision, so that this variable cannot be used to distinguish among the groups' probabilities of conversion. This supports Padel and Lampkin's (1994) conclusion that costs of gathering information are a major barrier to conversion.

The inspection service provided by KRAV for controlling and monitoring compliance is generally respected in Sweden. Satisfaction with this service (InspQual) was significant and positively related to the subsidy requirement. This implies that farmers who have not converted in the absence of a subsidy are reassured by the thoroughness of the inspection process. Over 88 percent of all converters in the sample felt the service was satisfactory.

The count of total outlets used by each respondent, from zero to eight possible, was recorded by the variable SellTot. SellTot was significant and negatively related to the subsidy requirement for conversion. Availability of marketing opportunities can substantially reduce the cost of collecting information and establishing contacts, thus reducing need for a subsidy. An average of one outlet was used by respondents, possibly due to proximity and quantity of output available for sale. Local shops (24 percent), grower cooperatives (19 percent), organic farmers' cooperatives (17 percent), grocery distributors (13 percent), farm shops (13 percent), saltå mill (9 percent) and kommun (3 percent) accounted for most farmers' choices. In addition, 13 percent of the sample fed some of their organic output to their farm animals. This allocation may reflect difficulty or cost associated with marketing, or may have been planned for producing organic livestock.

The number of organic farms in each county prior to the subsidy (NrOrg88) ranged from zero to a maximum of 18. The average was nearly 10, indicating that most of the farmers in the sample

had exposure to other organic farmers. NrOrg88 was significant and positively related to the subsidy requirement, which is counter to the expected relationship. This result may be an artifact of the structure of organic agriculture in the län. The more organic farmers already in the län, the more likely that all who would convert without financial inducement have done so.

Noneconomic factors (NonEcon) were cited as the primary reason for conversion by 79 percent of the sample. The estimated coefficient on NonEcon was not significant. For this sample there was no difference between those who converted due to the subsidy and those who did not require it. Possibly a majority of farmers feel organic agriculture has advantages over conventional systems, but financial barriers prevent many from converting.

Implications

The organic conversion subsidy instituted in Sweden in 1989 had a substantial impact on the conversion decision for 27 percent of farmers in the sample. Another 18 percent noted that the subsidy was a small factor in their decision to convert. Only 4 percent stated that the subsidy was their main reason for changing practices.

The subsidy helped offset transition costs to organic methods for these farmers, but this was not the only effect. As Padel and Lampkin (1994) explained, social acceptance and public support for organic farming are increasing, but rural communities still may resist change associated with widespread conversion to organic systems. The existence of a subsidy demonstrates that government and society recognize the positive externalities associated with organic agriculture and are willing to pay to obtain these benefits. National policies that favor organic agriculture send a strong message about social preferences to nonorganic farmers as well, potentially moving conventional agriculture toward more environmentally and socially sound practices. Providing the subsidy to already-

converted farmers may seem redundant. However, this policy rewards the information-gathering and risk-taking of the early innovators and promotes equity in distribution of rewards for practicing sustainable agriculture.

Of interest are the feasibility and effect of an organic subsidy on the agricultural sector in the United States, where organic production is growing slowly without financial support. Organic farmers are subject to the same agricultural policies as all producers (*e.g.*, quotas, marketing orders, conservation compliance) and are eligible for the same programs (*e.g.*, export enhancement, conservation and wetlands reserve, crop insurance). There are no policies that signal a positive social value to organic production systems. The National Organic Foods Production Act assures consumers of production attributes. To the extent that brand differentiation protects price premiums, this may support entry into the market by more organic suppliers but no direct inducements are offered.

In a climate of reduced direct support for agricultural production and greater reliance on manipulating market incentives, would an organic subsidy be acceptable? Fundamentally, organic agriculture is not believed to be an environmentally and socially superior production system in the United States by a majority of the populace. Even as observable indicators (demand) demonstrate increasing support for organic food systems, research that documents the social benefits of eliminating synthetic chemicals in food production is neutralized by assertions of dramatically reduced yields in organic systems. While it is generally held in Europe that organic systems are lower yielding (Lampkin and Padel, 1994), this is not the case in the United States, where equal or higher yields for organic systems are common.

Reluctance to use agricultural policy to achieve social goals unrelated to farm income, food distribution and yield implies that direct subsidies are unlikely. However, cost-sharing arrangements

for environmental improvements in management and infrastructure are common. This approach can help offset the transition costs, although it has less visibility from the standpoint of demonstrating public support. In the United States, it is likely that the payment or cost-sharing level would be at most equal to the price premium that could accrue following certification, and that eligibility would end following the minimum time needed to meet certification requirements. The reasoning is that the payment would represent a shifting of the expected market outcome (the price premium) to the beginning of the organic conversion process and would terminate when the market outcome is realized (certification is achieved). Unless environmental values are acknowledged and incorporated, it is unlikely that existing organic farmers would be eligible for payment schemes in the United States.

If direct payment or cost-sharing is possible, then what effect might be expected, based on the results from Sweden? Significant factors in adoption of organic production without subsidies are related to lower costs of transition - relatively smaller farm size, greater livestock diversity and more sales outlets. Farmers requiring subsidies tend to manage larger farms, be more concerned with organic inspection quality and adequacy of advice on organic methods, and reside in areas with more organic farms. In the United States, the scale of and specialization in agriculture and the market orientation are more consistent with the characteristics of the Swedish farmers who required a subsidy. However, larger operations tend to have sufficient investment capital, land holdings, production management expertise, marketing channels, data collection systems and risk management strategies to enable gradual transformation without needing external financial assistance.[2] Moderate and small size holdings without corporate affiliation are most likely to require support for redirection toward organic production.

The 1,781 farmers receiving the organic subsidy represented about four percent of the 45,000 full-time and part-time farmers in Sweden at that time. The majority had exposure to local organic farmers, had adequate technical assistance in converting, expressed confidence in the inspection system, and had primarily noneconomic reasons for converting. In short, these growers were just on the margin of converting to organic production and required a subsidy to make it economically feasible to do so. There is substantially less exposure to organic systems among farmers in the United States. In addition, the infrastructure for transport, handling, packaging and marketing is geared toward conventional production systems. There are virtually no publicly funded organic farm advisors and few government funded researchers studying organic production and marketing systems. Most organic information is disseminated by farmers and private organizations. These combine to generate formidable barriers to large scale organic conversion.

Reliance on the market system for rewards, information inputs (advising and research) and marketing information means that organic associations in the United States have tended to be localized in their effectiveness. Building a critical mass of farmers and consumers to develop viable local input and output markets takes longer because there is no coordination of information about supply and demand, including derived demand for inputs. Certifying organizations and private advisors may have less credibility, because there is little professional oversight of their activities. A subsidy or cost-sharing would have little effect on these factors, and so it is likely that a payment would affect the same cohort of farmers in the United States as in Sweden. That is, farmers with some familiarity with and support for organic systems who have access to credible information about conversion. This tends to favor regions where larger numbers of organic farmers and strong networks already are, as in the West, the Great Lake States and the Northeast.

Financial assistance would likely speed the conversion process in these areas, but would not necessarily induce mass conversion in other parts of the United States. Even if organic acreage growth continues at the pace indicated by data from OFRF (1993, 1996) and Greene and Calvin (1997), that is, about 41 to 47 percent every two to three years, organic acreage will not achieve 10 percent of total acreage in the United States for 10 to 15 years.[3] If European results were achieved, and a 300 percent increase in conversion occurred, this would mean the 10 percent share for organics would be achieved in four to six years. This assumes that organic input sectors are available to provide expertise, equipment and materials needed for conversion on such a scale, and that price premiums do not decline. Greater costs or lower revenues alter the calculation made by potential converters and may change the payment level required. Furthermore, even the Swedish farmers who required the subsidy were already inclined toward conversion. There is no information about what percentage of U.S. farmers want to convert to organic methods, so the upper limit on conversion with a subsidy is unknown. Incentive compatibility of a conversion scheme with other agricultural and environmental policies that influence farmers' decisions would be required to clear the way for maximum response to a payment.

The outcome of the organic conversion subsidy implemented in Sweden provides lessons for U.S. policy makers. First, only if the environmental and social benefits of organic agriculture are acknowledged and valued is it possible to justify any payment scheme to support conversion. Second, if farmers are to convert larger acreages to organic agriculture, thus giving more marginal environmental benefit per unit of program cost, reliable inspection and technical support must be made available. Information gathering on markets and production practices should be as low cost as possible, which may entail additional expense in publicly funded research and extension. Third,

targeting payments toward those knowledgeable about and favorable to organic production will result in a lower cost program. Farmers with noneconomic reasons for converting will accept conversion payments that just offset costs rather than requiring higher payments as inducements. The potential for market growth is tremendous. It is time to move beyond the idea that organic food is a niche market and seriously invest in the organic agricultural sector.

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Footnotes

[1] Demeter, an international organization, is the second largest certifying body in Sweden. Demeter incorporates more intensive soil stewardship requirements than KRAV. In the sample used for this research, 76 percent of farmers were certified by KRAV, 12 percent by Demeter, and the remaining 12 percent used another certifier or were not officially certified.

[2] The tradition of agricultural subsidies in Sweden and in Europe encourages management decisions that take advantage of financial support. Even though scale factors suggest they were not needed by large farmers, the availability of conversion subsidies probably influenced decisions in some way.

[3] This calculation assumes that organic acreage makes up as much as 2 percent of total acreage currently, as suggested by some sources, and that growth is 47 percent per two to three years.

Table 1. Data and Variable Description

Variable	Description	Mean	Standard Deviation
Effect	Not converted before 1989 and farmer said the subsidy influenced conversion, dichotomous, 1 if yes	0.267	0.443
Paymt	Subsidy to farmers, discrete, ranging from SEK 700 to SEK 2,900 per hectare per year, by län	1743.200	560.290
ArabAcr	Arable acreage, discrete, ranging from 5 to 200 hectares	34.991	40.117
AnimDiv	Number of livestock types on farm, sum of dummy variables for milk cows, beef cows, pigs for slaughter, ewes, horses and hens, discrete, ranging from 0 to 6	1.709	1.393
SourcTot	Number of sources consulted for advice on organic farming, sum of dummy variables for state advisor, local advisor, other advisor, control official, farmer, study circle, books or other source, discrete, ranging from 0 to 8	1.891	1.022
AdeqHelp	Adequacy of technical and economic advice on conversion, dichotomous, 1 if yes	0.793	0.406
InspQual	Satisfaction with inspection service for monitoring organic compliance, dichotomous, 1 if yes	0.884	0.321
SellTot	Number of sales outlets, sum of dummy variables for organic farmers' cooperative, saltå mill, growers' cooperative, kommun, grocery, local shop, farm shop or other outlet, discrete, ranging from 0 to 8	1.013	0.876
NrOrg88	Number of farms fully converted or in conversion to organic methods as of 1988, by län	9.849	5.017
NonEcon	Primary reason for converting was noneconomic: enjoyment, anthroposophy, environment, health, food quality, ergonometric or previous experience, dichotomous, 1 if any of these	0.789	0.408

Table 2. Probit Model Parameter Estimates for Required Conversion Subsidy

Explanatory Variable	Coefficient
Subsidy to Farmers (Paymt)	0.0002*
	(1.866)
Arable Acres on the Farm Operation (ArabAcr)	0.0024*
	(1.677)
Diversity of Animal Operation on Farm (AnimDiv)	-0.089*
	(-1.949)
Sources of Advice on Organic Farming (SourcTot)	-0.043
	(-0.690)
Adequacy of Technical Advice on Organic Farming (AdeqHelp)	0.391*
	(2.406)
Satisfaction with Inspection Service (InspQual)	0.348*
	(1.662)
Sales Outlets for Organic Products (SellTot)	-0.281*
	(-3.619)
Number of Organic Farms in Län, 1988 (NrOrg88)	0.023*
	(1.899)
Noneconomic Reasons for Conversion (NonEcon)	-0.128
	(-0.883)
Intercept	1.333*
	(-3.688)
Maddala R-Square	0.08
Observations at 1	147
Observations at 0	403
Percentage of Correct Predictions	73.5

The dependent variable is **Effect**. Asymptotic t-values for the probit model are given in parentheses. Asterisk indicates significance at the 0.10 confidence level.