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Organic Demand: A Profile of Consumers in the Fresh Produce Market

by John Stevens-Garmon, Chung L. Huang, and Biing-Hwan Lin

JEL Classification Code: Q13

Demand for organic produce in the United States has increased steadily since the early 1990s. In 2000, for the first time, conventional supermarkets sold more organic food than any other venue (Dimitri & Greene, 2002). According to the Organic Trade Association (OTA), organic food sales in the United States totaled $13.8 billion in 2005, making up 2.5% of the retail food market. This is an increase from 1.9% in 2003 and from 0.8% in 1997 (OTA, 2006). This increase coincides with the implementation of national organic standards by the USDA in October of 2002, which provided uniform labeling for consumer recognition. Demand trends are expected to continue as more conventional retailers take up a larger portion of the organic market. Sales of organic foods are estimated to rise to $23.8 billion by 2010 (NBJ, 2004).

The phenomenal growth in organic sales in recent years has brought additional farmland into organic agriculture industry. Dimitri and Greene (2002) estimated that between 1997 and 2001, U.S. farmers and ranchers nearly doubled the acreage of certified organic land, totaling to 2.3 million acres. With increasing production and supply of organic produce and meats, organic food, once considered a niche product, has become more available and affordable for consumers in mainstream grocery stores. It is estimated that 46% of total organic food sales are now handled by the mass-market channel, which includes supermarkets, grocery stores, mass merchandisers, and club stores (OTA, 2006). A popular perception tends to suggest that most organic consumers are white, wealthy, and have young children. However, the consumer base of organic food appears to have become more diverse and cannot be easily pigeonholed as the market is growing with increased availability and popularity. A study by the Hartman Group (2002) found that half of the respondents who purchased organic food frequently have an annual income below $50,000, and that African Americans, Asian Americans, and Hispanics purchase more organic products than Caucasians.

Our analysis used the Nielsen Homescan data from 2001 and 2004 (Box 1) to determine the characteristics of organic consumers, what they buy, how much they spend, and the price premiums they pay for organic produce. These two years give us a sample from before and after the implementation of the National Organic Program's (NOP) labeling standard. We focus on fresh produce because produce represents the largest sector, at about 39% of the organic market (OTA, 2006). One may speculate that the growing popularity of organic consumption could be attributed at least partially to the implementation of NOP. However, it is not our intention to contribute to the debate on the effect of NOP, mainly because Homescan data are not suitable for examining such an issue. We simply present a cursory look at the data to examine whether any notable changes have occurred after NOP by comparing household purchases of fresh produce in 2001 and 2004.

Who Buys Organic Produce?

Of all demographic characteristics, race seems to be the most correlated with organic expenditures. In 2001, we found that Asian Americans, compared to other ethnic groups, spent the most food dollars to purchase organic produce on a per capita basis. Though they bought comparable amounts of fresh produce, Asian Americans, on average, spent more on organic produce than White, Afri-

Box 1. The Sample Data and Description.

The Nielsen Homescan panel data include purchases of both random-weight and Uniform Product Code (UPC) food items. According to Nielsen, the panel consists of representative U.S. households that provide food purchase data for at-home consumption. For 2001 and 2004, more than 8,164 and 8,430 households, respectively, participated in the Homescan panel. In general, panelists report their purchases weekly by scanning either the UPC or a designated code for random-weight (unpackaged) products of all their purchases from grocery stores or other retail outlets. For packaged or UPC-coded food products, organic produce can be identified by the presence of the USDA organic seal or with organic-claim codes created by Nielsen. For random-weight items, the descriptions of designated codes can be used to identify organic produce. Homescan panelists do not report prices they pay for each food; they report total quantity and spending for each food. In addition, the Homescan data include product characteristics and promotion information, as well as detailed socio-demographic information of each household. For our analysis, household spending on selected fresh produce was calculated as average expenditures on per purchase record basis. Prices for organic and conventional produce were derived as unit values based on the household's reported expenditures and quantities. Average household expenditures on fresh produce were expressed in terms of per capita to control for household size effect. Furthermore, all expenditures and prices were expressed on nominal current dollars for 2001 and 2004, respectively. The Consumer Price Index for food and beverages increased by 7.49% from 2001 to 2004, and this inflation rate is used to calculate changes in real terms.

can, or Hispanic Americans. By 2004, Asian Americans' expenditures on organics fell, while White, African, and Hispanic Americans increased their spending on organic produce (Figure 1). Further, African Americans have replaced Asian Americans to become the ethnic group that spent the most on organic produce. The proportion of African Americans who purchased organic produce also increased from 34% in 2001 to 37% in 2004, while the proportion of organic users among other groups have remained relatively the same. These findings are in general agreement with the report that Asian, Hispanic, and African Americans are the ethnic groups more likely to purchase organic foods than Whites (Hartman Group, 2002). According to a more recent study by the Hartman Group (2006), Asians and Hispanics are motivated primarily by family concerns in buying organic products.

Organic expenditures vary by region. We found that in 2004, households in the Western United States purchased more organic produce than those residing in other regions, spending on average about $4.90 per capita. This spending amount represents an increase of 19% over 2001, after adjusting for inflation. Households residing in the northeastern and southern regions also registered an increase in average per capita spending on organic produce. The Central United States showed the lowest average per capita expenditure in 2004, which remained virtually unchanged from 2001. In terms of proportion of households that purchased fresh organic produce, the western region also showed the largest increase (almost 4%) of organic users from 2001 to 2004. The West and South appear to be the two fastest growing markets for organic produce in the United States.

According to Homescan data, the average per capita spending on organic produce increased by 12% in real terms between 2001 and 2004. As shown in Figure 2, this increase in spending is observed for all households across various income groups. It is interesting to note that average per capita spending on organic produce exhibited a U-shape relationship with income for households earning less than $45,000 annually. Among households earning $45,000 and more, organic spending appears

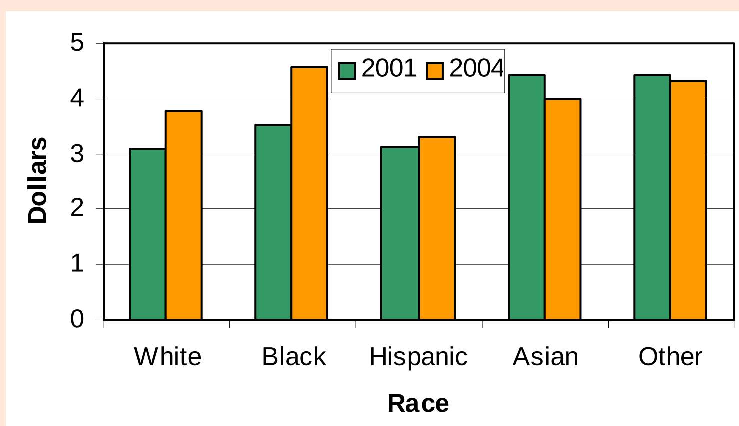

Figure 1. Average per capita spending on fresh organic produce for home consumption by race.

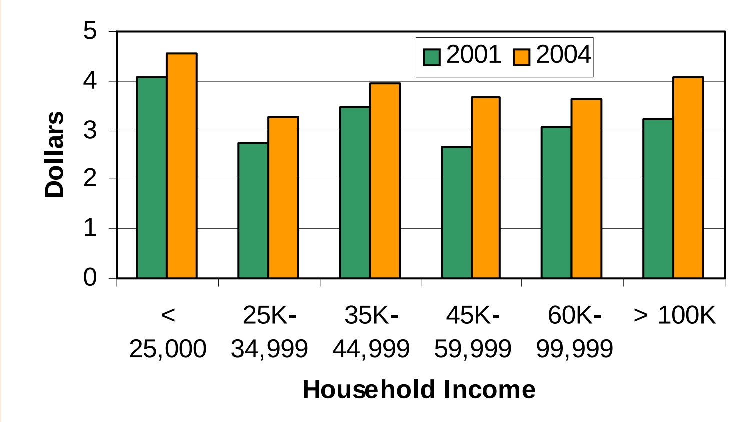

Figure 2. Average per capita spending on organic produce for home consumption by income class.

to rise with income. These patterns between household income and organic spending are observed for both 2001 and 2004. It is somewhat surprising to find that households with the lowest income level of less than $25,000 spent the most—more than $4 per capita on organic produce in 2001 and 2004. Furthermore, households in the $35,000–$44,999 income bracket spent about as much on organic produce per capita as those households earning over $100,000 annually ($3.94 versus $4.09 in 2004). For households with annual income at $25,000 or above, there appear little variations on average per capita spending on organic produce in 2001 and 2004. Overall, there is little consistent association between per capita expenditures on organic produce and household income. Studies suggest that lower income families choose to buy organic when possible as a means of preventative medicine, and thus are at least as likely to purchase organic as other income groups (Hartman Group, 2003; OTA, 2004).

The lack of a clear positive association between organic expenditure and income level may have prompted Laurie Demeritt, President of the Hartman Group, to observe that "income is about the only thing that doesn't skew at all by user and non-user. You get little skews in age, little skews in geography, little skews in education, but there's nothing at all for income, so we don't even look at that any more" (Fromartz, 2006). A recent survey conducted by the Food Marketing Institute (2004) showed that only 11% of organic shoppers polled bought organics at a natural-food supermarket, while 57% bought at mainstream grocery stores and discount stores. The fact that mainstream grocery stores are replacing the specialty food stores as the major outlets for organic foods could explain the seemingly fading relationship between organic expenditure and household income. It appears that income may no longer be a good predicator to profile organic consumers as the industry continues to grow and evolve into maturity.

What Do Organic Consumers Buy and How Much Organic Premium Do They Pay?

According to Homescan, tomatoes, potatoes, carrots, onions, lettuce, apples, oranges, bananas, grapes, and strawberries were the top five vegetables and fruits in terms of their shares of fresh produce expenditures for home consumption. American households spent more on organic produce between 2001 and 2004 for all produce except oranges and lettuce. Overall, average per capita spending on these organic fruits and vegetables increased from $1.64 in 2001 to $1.91 in 2004, an increase of 8.5% in real terms. Tomatoes appear to be the most favored organic vegetable among American consumers with average per capita spending amounts 3–4 times those of other organic produce in both 2001 and 2004. Per capita spending on organic apples and lettuce held distant second and third places in 2001, while carrots and apples were ranked second and third, respectively, in 2004. Strawberries and bananas registered the largest increases in organic expenditures by 45% and 33%, respectively.

Since organic agricultural production is typically more cost intensive than conventional agriculture, many organic farmers rely on the premiums that organic foods carry to cover their extra costs. High premiums usually indicate high demand, signaling to producers which markets may be expanded. As indicated previously (Box 1), we calculated unit values (spending over quantity purchased) to derive price premiums for selected fresh produce because Homescan panelists do not report prices of organic and conventional produce. Thus, the organic premiums derived from unit values are not strictly the same as would be observed from the unit prices, if available. Except for oranges and onions, average organic premiums for the most valuable produce increased from 2001 to 2004 (Figure 3). In 2001, average organic premiums varied from 1% ($0.01/lb.) above the conventional produce for carrots to 78% ($0.32/lb.) for potatoes. In comparison, organic premiums varied from 9% ($0.08/lb.) for oranges to 78% ($0.36/lb.) for potatoes in 2004. According to our calculations, organic potatoes carried a substantially higher price premium than other organic produce in both 2001 and 2004. This finding can be useful to organic producers who are looking for new crops to improve their profit margins. The changes in organic premiums between 2001 and 2004 were relatively moderate among the most valuable produce, except for lettuce and carrots.

In terms of dollar amount, average organic premiums that consumers paid in 2004 for apples, grapes, strawberries, tomatoes, and potatoes were fairly uniform at about $0.35/lb. above their conventional counterparts. There are substantial variations among individual fresh produce, most notably in carrots and lettuce, which registered the largest increases in price premiums between 2001 and 2004. Tomatoes and apples also showed an increase in average price premiums by 52% and 75%, respectively. Overall, the average price premium for the selected produce increased from $0.19/lb. in 2001 to $0.29/lb. in 2004, which represents a 42% increase in real terms.

Price plays an important role in consumers' purchase decisions. A survey by Walnut Acres (2002) reported that 68% of consumers cited high prices as the main reason they did not buy organic foods. However, to many organic consumers, price could be of secondary consideration. They are willing to pay a price premium because they value and demand certain attributes from organic products. To them, the organic attributes are well worth the price difference. The

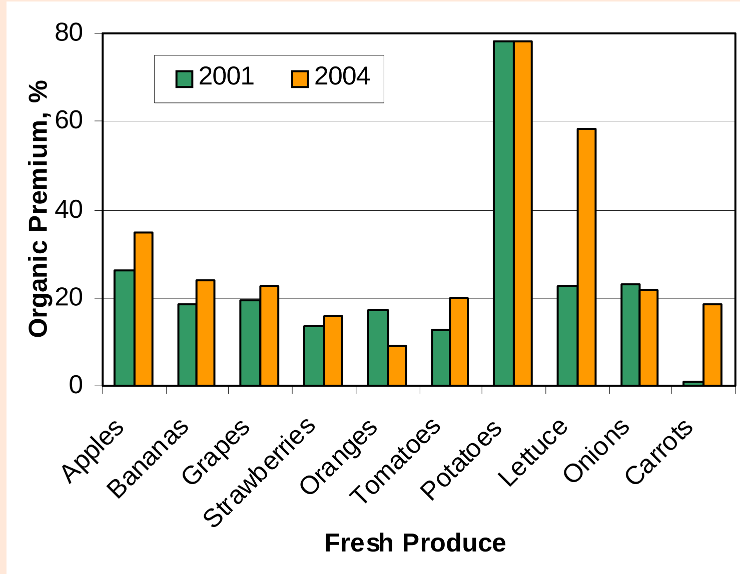

Figure 3. Average price premiums as % of conventional price for the top 10 most valuable organic produce.

fact that we find the organic premiums for most selected fresh produce increased from 2001 to 2004 suggests that the demand for organic produce remains strong, and consumers are willing to pay additional dollars for the organic attribute.

Based on limited data on organic prices over the period 2000–04 at the farmgate and wholesale levels, Oberholtzer, Dimitri, and Greene (2005) show that prices for organic varieties are comparatively more volatile than their conventional counterparts and organic price premiums were higher at the wholesale level than at the farmgate level. Of the three produce (broccoli, carrots, and mesclun mix) studied, they found that average annual organic price premiums at wholesale, as a percent of conventional prices, increased for carrots (143% to 148%) and for broccoli (141% to 153%) between 2001 and 2004, while the price premiums decreased for mesclun mix from 9% to 7%. It should be noted that the organic premiums calculated from the Homescan data are not directly comparable with those reported in Oberholtzer, Dimitri, and Greene (2005). However, one would expect relatively lower organic price premiums at the retail level than at the wholesale or farmgate level as organic foods are becoming more competitive and increasingly marketed through mainstream supermarkets and discount club stores.

A Profile of Consumer by User Group

In our analysis, we categorized each household into user or nonuser group according to whether or not the household purchased organic produce. Then user households are classified into one of three user groups based on sample distribution of per capita spending on organic produce. In 2004, the first quartile of organic users with per capita spending greater than $0 but less than $0.75 is defined as light users, the second and third quartiles are defined as medium users (between $0.76 and $3.65), and the fourth quartile is the

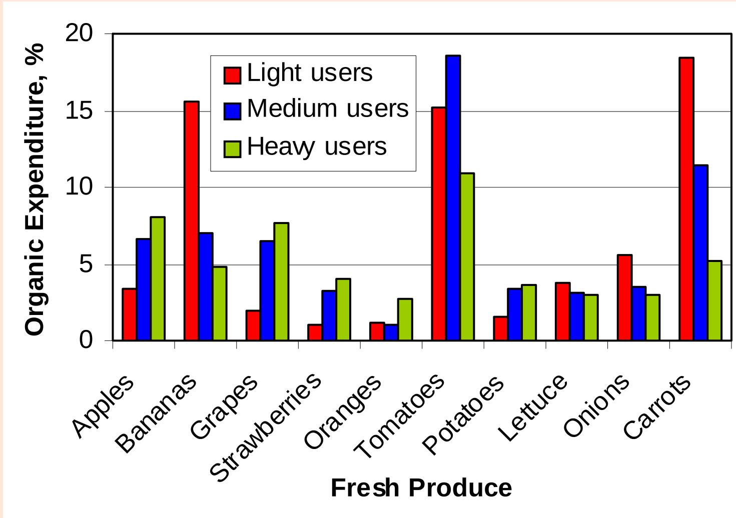

Figure 4. Market shares of selected organic produce by user group, 2004.

heavy users (> $3.65). The nonusers account for 62.5% of the 2004 sample, while light, medium, and heavy users account for 9.6%, 18.6%, and 9.4%, respectively. In comparison, the proportion of user groups in 2001 are 62.9% (nonusers), 9.5% (light users), 18.4% (medium users), and 9.2% (heavy users). Overall, the result shows that proportionally more consumers have become organic users in 2004 than in 2001, with a slightly higher increase in both medium and heavy user groups. Per capita spending on organic produce by medium users increased from $1.45 in 2001 to $1.81 in 2004; an increase of 16% in real terms. For the light and heavy users, the growth in real per capita organic spending increased by 10% from 2001 to 2004.

With respect to market shares of selected organic produce across user groups, Figure 4 shows that light users spent the largest proportion of their organic expenditures on carrots, bananas, and tomatoes. The medium users purchased more tomatoes and carrots relative to other kinds of fresh produce, while heavy users seemed to expend a larger proportion of their organic budgets on tomatoes, apples, and grapes. Overall, organic tomatoes appear to be the favorite fresh produce among the organic users, accounting for more than 15% of light and medium users' organic produce expenditure and more than 10% for heavy users. It is interesting to note that organic vegetables appear to be the preferred organic produce of light users, while the heavy users seem to have an affinity for organic fruits, especially apples and grapes. Heavy users buy proportionately more of each fruit than either the light or medium users, except for bananas. On the other hand, they tend to buy less of each vegetable than either the light or medium users, except for potatoes.

Comparing demographic information across user groups in 2004 gives us further insights in terms of how organic expenditures are related to these characteristics. As shown in Table 1, heavy and medium users have the largest proportions of those who have at least a bachelor's degree, while a larger portion of nonusers and light users have either a high school diploma or some college. Interestingly, households whose heads have less than a high school education account for 1.9% of heavy users, the highest among all user groups. With respect to age, heavy users seem to comprise the largest proportion of the youngest households (household head age < 30 years), while the light users' group has the largest proportion of household head age between 30 and 49 years old. Medium and heavy users also have the largest proportion of older households relative to nonusers and light users, with the age of household head 50 years and older. Most heavy users are found in the Southern and Western United States, and the fewest are found in the central region. Medium users have the largest proportion of Whites relative to other user groups, while a relatively large proportion of Hispanic consumers belong to the light users' group. In comparison, heavy users are proportionally few among Whites, with the reverse being true for African, Asian, and other Americans.

Summary

We used the Nielsen Homescan data from 2001 and 2004 to analyze consumer purchase patterns of fresh organic produce. Our analysis shows that Asian and African Americans tend to purchase organic over conventional produce more than Whites and Hispanics. Households residing in the western region spent more on organic produce on a per capita basis than those residing in other regions. Contrary to popular opinion, we do not find any consistent positive association between household income and expenditures on organic produce. Although certified organic acreage has increased rapidly in boosting the production of organic foods, our analysis suggests that demand appears to be growing faster than the supply so that organic price premiums for most selected fresh produce remained relatively high in 2004, varying from 9% for oranges to 78% for potatoes. Among all fresh produce studied, organic potatoes appear to command the highest percentage of price premiums in both 2001 and 2004.

We classified all households into four groups: nonusers, light users, medium users, and heavy users, according to their per capita expenditures on organic fresh produce. The proportion of consumers buying organic produce increased between 2001 and 2004, suggesting an increasing organic penetration. In terms of demographic characteristics, medium and heavy users are represented proportionately more by older households with the age of household head 50 years and older. Heavy users also comprise the largest proportion of the youngest households (household head age < 30 years), while light users have the largest proportion of household head age between 30 and 49 years old. In addition, we find that light users expend a relatively larger share of their organic expenditures on bananas and carrots than both the medium and heavy users. Organic vegetables appear to be the preferred organic produce of light users, while the heavy users seem to prefer organic fruits, especially apples and grapes. For all organic users, organic tomatoes are clearly the preferred choice over other vegetables.

Table 1. Selected Household Characteristics by User Group, 2004.

Category	Nonusers	Light Users	Medium Users	Heavy Users	Total
Educational Level (%)					
Less than high school diploma	1.86	0.86	1.66	1.90	1.73
High school diploma	19.60	15.80	15.02	11.53	17.63
Some college	31.49	31.60	30.73	26.36	30.88
College degree	32.05	35.56	33.61	32.83	32.75
Post-college degree	15.00	16.17	18.98	27.38	17.01
Age of Household Head (%)					
< 30 years	1.44	0.86	1.21	2.15	1.41
30–39 years	12.46	13.59	9.33	11.91	11.93
40–49 years	24.06	29.01	20.38	19.90	23.46
50–64 years	38.72	35.19	39.17	39.04	38.49
65 years and older	23.32	21.36	29.90	27.00	24.70
Region (%)					
Northeast	20.41	22.59	25.24	23.45	21.80
Central	18.76	16.79	14.25	10.65	16.98
South	41.36	37.41	34.89	31.43	38.85
West	19.46	23.21	25.62	34.47	22.37
Race (%)					
White	74.08	71.48	76.61	67.93	73.72
African	13.44	12.84	11.69	15.59	13.26
Hispanic	8.17	10.49	6.84	8.37	8.06
Asian	2.72	3.46	2.81	4.06	2.93
Other	1.60	1.72	2.04	4.06	1.92
Number of households	**5,266**	**810**	**1,565**	**789**	**8,430**

Note: User groups are classified based on sample distribution of average per capita spending on organic produce per purchase record. The first quartile is defined as light users with per capita spending greater than $0 but less than $0.75, the second and third quartile are defined as medium users (between $0.75 and $3.65), and the fourth quartile is the heavy users (> $3.65).

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Water Quality Credit Trading and Agriculture: Recognizing the Challenges and Policy Issues Ahead

by Charles Abdalla, Tatiana Borisova, Doug Parker, and Kristen Saacke Blunk

JEL Classification Code: Q58

Economists have long championed market-based approaches over regulatory "command and control" approaches for addressing environmental problems. Recently, federal and state policymakers and some stakeholder groups have promoted market-based approaches for dealing with agricultural water pollution. At the federal level, the U.S. Environmental Protection Agency (US EPA) in 2003 issued a trading policy that allowed industrial and municipal point sources (PS) to meet their discharge requirements through purchase of "credits" from farmers and ranchers who implemented conservation measures that improved water quality. In October 2006, US EPA and the U.S. Department of Agriculture (USDA) reached an agreement to establish and promote water quality credit trading. In January 2007, USDA Secretary Johanns stated that in the upcoming farm bill, the administration will view market-based solutions as an important tool in federal environmental protection efforts aimed at agriculture (USDA, Natural Resources Conservation Service, 2007). At the state level, Idaho, Michigan, Ohio, Oregon, Pennsylvania, and Virginia have enacted laws or created regulatory programs to encourage water quality trading (see the summary of state efforts in ETN, 2007).

Given these activities, what can realistically be expected from market-based programs, and specifically water quality credit trading, in addressing the difficult issue of water pollution from agriculture? We conclude that policymakers are expecting far too much from trading as a tool to address agricultural nonpoint source (NPS) water pollution. Currently, water quality credit trading in agriculture is in its infancy and significant implementation challenges exist. Trading program design and implementation must address complex physical, social, economic, legal and public policy issues. This will require more exchange among economists, policymakers, farmers, municipalities, and other stakeholders than is currently occurring. Only then will trading as a potential tool be fully understood and appropriately implemented.

In a previous issue of *Choices*, King (2005) examined issues encountered by water quality trading programs. We observe that changes in conditions affecting the supply and demand sides of potential water quality credit trading markets suggest the need to re-evaluate challenges that confront trading programs.

Non-Point Source Ag Pollution in the United States

According to the 2000 National Water Quality Inventory, agricultural NPS pollution is the leading source of impairment to rivers and lakes, and a major contributor to degradation of estuaries (Figure 1). Pollutants from agricultural croplands and livestock operations include excess fertilizer, herbicides and insecticides, sediment, and bacteria.

Controlling agricultural runoff is a longstanding and difficult problem. Agricultural NPS pollution loading is spread over large areas, and monitoring and measuring it is technically difficult and expensive. Agricultural runoff is highly variable due to the effects of weather variability, site-specific characteristics of the natural environment (e.g., soil type and land slope), and non-observable farm management practices (such as timing and precision of fertilizer application). While the cumulative effect of agricultural runoff can be observed through ambient water qual-

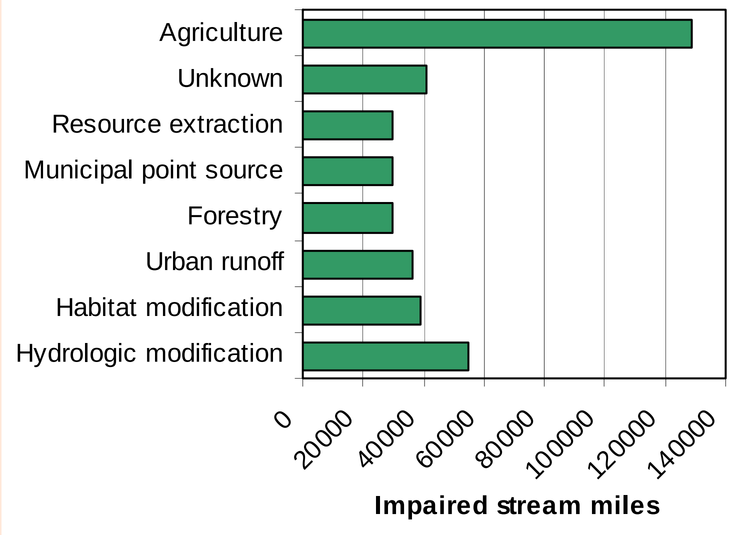

Figure 1. Leading sources of impairment of surveyed rivers and streams in the United States.
Source: USEPA, National Water Quality Inventory: 2000 Report, No. 841R02001, August 2002.

ity monitoring, it is generally impossible to trace the pollution back to specific farms. Existing computer models provide imperfect estimates of agricultural pollution loads. As a result, actual pollution amounts from a specific field or property are not fully known to regulators or farmers. Moreover, due to the variability in pollution loading, producers only partially control the runoff from their fields (Horan & Shortle, 2001; Braden & Segerson, 1993).

Accordingly, policymakers have long avoided environmental regulatory requirements for the agricultural sector. For example, the federal Clean Water Act excludes all agricultural sources (except for concentrated animal feeding operations - CAFOs) from federal regulation. Also, imposing environmental regulation will likely reduce agricultural producers' profits and may make U.S. agriculture less competitive than other nations with rules that are less stringent (Abdalla & Lawton, 2006). Instead of imposing environmental regulation, policymakers have offered incentive payment programs to encourage farmers to voluntarily adopt environmental protection measures in the form of best management practices (BMPs) (NRCS, 2006).

This approach has failed to solve the water quality problems caused by agricultural runoff. Limited federal and state budgets constrain expansion of incentive payment programs for agricultural BMP implementation, and the existing programs have not always been cost-efficient (Babcock et al., 1995). At the same time, the policy of further reductions of point source (PS) pollution loads is no longer feasible. Increases in urban population bring about increases in pollution loading from municipal PS (wastewater treatment plants), and the necessary upgrades of industrial and municipal PS are costly.

Water quality credit trading policy seems to offer an easy solution to these problems. Economists have long argued that allowing PS to purchase pollution reduction credits from NPS will provide a low-cost alternative to PS upgrades (Baumol & Oates, 1988; Pearce & Turner, 1990; Faeth, 2000). Trading programs provide PS with flexibility in how to achieve their pollution loading limits, which creates incentives to discover cheaper and more efficient abatement methods. Credit sales could provide farmers with needed financial resources for BMP implementation. Trading is also attractive to policymakers and some stakeholders because it may provide private funds to supplement (or replace) federal and state incentive programs (King & Kuch, 2003).

However, agricultural pollution runoff does not meet the economic textbook definition of a tradable commodity. As a result, designing a water quality credit trading program poses a set of challenges. These are discussed in the next section.

Realizing the Potential: What Does Economic Theory Suggest as Critical Elements of a Water Quality Trading Program?

A water quality credit trading program is established to meet specific pollution reduction goals. Table 1 summarizes elements that are necessary for inclusion or consideration in the implementation of a program.

Critical elements of a water quality trading program. Even with these components in place, certain challenges must be addressed for a water quality credit trading program to operate. Many of the challenges relate to PS-NPS trades, where the regulated community (NPDES[1] permit holders) meets the unregulated community (agriculture and other NPS). In a 2005 issue of Choices, King examined the potential supply and demand for water quality credits. King states that, on

1. *National Pollutant Discharge and Elimination System.*

Table 1. Critical elements of a water quality trading program.

Public water quality goals	Set by federal, state, or local authorities based on public input and can be defined in terms of ecosystem function, fish population or public safety, or as surface water quality standards.
Pollution cap for a watershed	Limit on the total pollutant load from all sources to a water body. The justification for and size of the cap is based on the public's water quality goals. Usually the cap is set for an annual load of specific pollutants.
Regulated baseline for point sources or nonpoint sources	Numeric level of pollutant load allowed at a particular point in time. If all polluters meet their regulated baseline, the pollutant cap for the watershed will be obtained.
Unregulated baseline for agricultural nonpoint sources	Minimum level of pollution abatement that an unregulated agricultural operation must achieve before it can participate in a trading program. Sometimes called the threshold.
Credits	Units of goods (pollution reduction) to be traded in the water quality credit market. Credits are generated for every unit of pollution reduction beyond the baseline level.
Sellers (credit suppliers)	Dischargers that reduce pollution below the baseline and generate credits for sale in the market. Credits can also be sold by intermediaries, if allowed by program rules.
Buyers (demanders for credits)	Dischargers with regulated baselines for whom pollution reduction is expensive. For these sources, it is less costly to buy pollution credits from other parties and use these credits to help achieve their baseline loads. Credits can also be purchased by intermediaries and third parties, if allowed by program rules.
Trading ratio	Number of load reduction credits from one source that can be used to compensate excessive loads from another source.
Regulator	Entity that determines the water quality goals, establishes caps for pollutants in a watershed, approves and administers the trading program, and monitors and enforces the rules.

the demand side (PS), few dischargers are interested in buying water quality credits if the discharge restrictions are weak or un-enforced. More recently, many states have set limits for PS that are either already binding or are expected to become binding as populations grow. In some states, sources will be required to completely offset all new pollution loads. Thus, we expect that the demand for credits will change. In relation to NPS, King associates the lack of supply with agricultural producers' desires to avoid environmental regulation. King argues that by participating in trading programs, producers make the implicit admission that NPS pollution can be measured and controlled. As a result, some farmers are concerned that trading could lead to increased regulation. However, in the past few years, a shift in perspective has been occurring. The federal and many state governments have passed regulations that require agricultural producers to implement practices to better manage runoff from their farms. Thus, producers are beginning to view trading as a way to hold off the implementation of future regulations. Despite these changes in conditions affecting both the supply and demand of potential water quality credit trading markets, other significant challenges still confront trading programs. Some of the key challenges are discussed below.

Challenges to Water Quality Credit Trading

Setting pollution caps. In order to ensure that a water quality credit trading program achieves public water quality goals, a maximum loading or "cap" for each pollutant must be set for a watershed and enforced by the regulatory agency. While public water quality goals are often linked to services a water body provides (e.g. fish habitat), trading requires that a cap be defined for specific pollutants. This presents a challenge for accurately estimating the amount of pollution reduction necessary to achieve the public goals. In addition, many trading programs leave unregulated agricultural NPS out of the pollution cap, eliminating the link between public water quality goals and the program results (King & Kuch, 2003). Moreover, consistent enforcement of the cap is a necessary condition for trading.

Establishing allowable pollution limits (baselines). An unrestrictive cap on PS can diminish or eliminate the demand for credits. Conversely, setting a high baseline can reduce the NPS will or ability to produce an adequate supply of credits. Besides affecting the functionality of the credit market, assigning baselines raises the fairness issue since the parties with restrictive limits need to incur costs to achieve these limits. Baseline limits also raise questions about responsibility for pollution clean-up and about property rights of landowners. For example, many agricultural BMPs are funded with public cost-share money. A debate exists about whether BMPs installed with public funds are the property of farmers, and if so, whether these credits should be eligible for trades (Horan et al., 2004).

Theoretically, the agricultural baseline load should be linked to public water quality goals. This guarantees that the reductions beyond the baseline ("credits") reflect additional environmental benefits produced by the source and supplied to the water quality credit market. In practice, the baseline is often set in relation to the current level of pollution, without regard to public water quality goals. In addition to jeopardizing public water quality goals, such baselines may create perverse incentives. For example, baselines may penalize those who have already implemented BMPs and reward those who have not by paying them for BMP implementation through credit sales (King & Kuch, 2003).

Complexities in establishing credits and associated risks with agricultural credits. For NPS, pollution reduction from a BMP is difficult to accurately predict and monitor. The effectiveness of a BMP depends on its age, implementation factors, how well it has been maintained, and on site-specific conditions. Scientific models are often used to estimate load reductions from BMPs. However, imperfections persist in models and estimated reductions from a BMP likely differ from actual loadings. This complicates the process of credit verification and creates uncertainty about the magnitude of water quality improvements from a trade (Ribaudo et al., 1999). Also, requirements to improve credit verification processes and increase accuracy in pollution reduction estimation can significantly increase costs associated with credit trading. Consequently, the number of willing credit sellers and buyers may be reduced (King & Kuch, 2003).

In addition to these measurement and verification complexities, the uncertain nature of agricultural pollution reduction also implies that credit sellers (farmers) do not have complete control over the "goods" they sell (Shortle, 2007), while credit buyers "face the risk of having the quantity bought falling below claimed level" (McCarl, 2006). In the majority of trading programs, variability in NPS pollution reduction is averaged and annual averages are used. The risks associated with agricultural credits are addressed in existing programs by requiring PS to purchase several NPS pollution reduction units to compensate for one unit of their own pollution increase (i.e., uncertainty trading ratio). However, such trading ratios implicitly increase the price the PS needs to pay for NPS pollution reductions. While the majority of trading programs employ ratios of greater than one, it has also been argued that trading ratios can be either less than or greater than one, depending on the variability of the agricultural discharges (Horan, 2001; Horan et al., 1999; Horan & Shortle, 2001).

Transaction costs. Transaction costs are costs that must be incurred to carry out a trade. Examples include the degree of difficulty in finding a buyer or seller, verifying credits, and negotiating and enforcing a trade. Trading will not occur if the transaction costs exceed the benefits of a potential trade (Stavins, 1995; Malik, 1992; Krutilla, 1999). Water quality credit trading programs that involve agricultural NPS are characterized by higher transaction costs than programs involving PS only. The transaction costs of finding a trading partner are higher because NPS are widely distributed across a watershed, and each source can generate only small numbers of credits in comparison with the larger demand of PS credit buyers (Woodward, 2006).

In addition to the costs of finding a trading partner, the measurement, verification, and enforcement of agricultural NPS pollution reduction can be costly because of the nature of NPS pollution runoff (Woodward, 2006). Also, for all water quality credit trading programs, negotiating a trade can be difficult because of the novelty of the markets (Woodward, 2003). Unlike other environmental markets (e.g., wetland banking or SO_2 emissions trading programs), rules for water quality credit trading are not yet clearly defined and vary across programs. Many programs are complex, which increases the transaction costs for reaching agreements between potential credit trading partners. Examples of unclear and complicated rules include the credit certification process, credit resale, credit life span, monitoring and maintenance, liability, sale approval prices, and pricing. For example, in their survey of farmers and agency staff to assess perceptions of policies for NPS control, McCann and Easter (1999) found transaction costs for water quality credit trading to be problematic. The survey revealed that the trading program's administrative costs were perceived to be the fifth most expensive among the policies considered. Woodward (2003) suggested that transaction costs associated with NPS trades may decrease as program participants become more familiar with the rules and other trading partners, and become more confident in credit estimation and approval procedures.

Enforcing contracts and liability issues. For the benefits of trading to be realized, there must be a mechanism to ensure that agreements arrived at are met. For example, in a PS-NPS trade, the potential buyers (PS) are liable for achieving pollution reductions as mandated by their NPDES permit limits. In contrast, the only document binding the potential sellers (NPS) is the private contract with the buyer. Most existing trading programs hold the buyer responsible for monitoring the seller and enforcing the trade agreement. However, because the credit buyer and seller are more likely to focus on the credit price (as opposed to credit quality, i.e., delivering actual pollution load reductions), the regulator may bear more responsibility for verifying credits, and enforcing agreements (King & Kuch, 2003). By holding only the credit buyer liable for achieving pollution reductions, the regulator reduces the buyer's (PS) willingness to engage in an agreement. Suggested approaches to alleviate liability issues include the use of a mediator that can monitor and enforce the trading contract and place purchased credits in an "insurance pool" to guarantee that the NPDES limits are met even if one of the sellers fails to deliver the credits. The latter approach is used by the Pennsylvania and Ohio programs.

Leakage. Implementation of a trading program in one watershed or region can potentially lead to countervailing actions in areas outside the watershed. Stephenson et al. (2005) define leakage as an occurrence in which "a trade results in a net increase in loads." For example, it is proposed that some of the agricultural credits certified by Pennsylvania's trading program be generated by transporting manure/poultry litter to nutrient-deficient regions outside of the Chesapeake Bay watershed in Pennsylvania. If information concerning nutrient availability in soils in the receiving watershed is not well known, manure/litter importation can lead to increases in water pollution. Stephenson also provided an example about a farmer who installs a riparian buffer as a BMP, and generates and sells credits. However, to compensate for reductions in productive land due to buffer implementation, the farmer expands the productive acreage in a different place, increasing the nutrient and sediment loads in that vicinity.

The genesis of water quality credit trading in the Chesapeake Bay Region. Years of nutrient and sediment related pollution have caused significant impairments in the Chesapeake Bay. In 2000, the renewed Chesapeake Bay Agreement established ambitious targets for member states to significantly reduce their portion of nutrient pollution by 2010. These regional goals have had a ripple effect on each state in the watershed.

By 2003, Maryland instituted tributary strategies that placed caps on nutrients entering the state's waters. These caps were the impetus for Pennsylvania to seek new means for reducing its nutrient loads that flow across state lines. In 2006, Pennsylvania adopted its nutrient trading policy that enables PS-NPS trades. Pennsylvania is also attempting to ratchet down municipal sewage treatment plants' nutrient limits.

Virginia recently established a PS-PS trading program with the intent to eventually include NPS in trades.

Maryland and West Virginia are also in varying stages of developing state trading programs.

It is much too soon to judge how successful water quality credit trading will be in meeting the collective reductions necessary for improving and restoring the Chesapeake Bay.

Scale of the trading program. Many existing water quality credit trading programs have been developed for relatively small watersheds. However, in a larger watershed, more opportunities exist to find a trading partner with significantly different pollution abatement costs. Thus, greater reductions in costs of meeting public water quality goals can be realized. Also, in a large watershed, a large number of buyers and sellers can help ensure that the market participants do not exploit the market power or distort efficient trading (Woodward, 2003; Hahn, 1989: King & Kuch, 2003). Currently, the regulatory driver for developing trading programs for larger regions is often lacking. Water quality standards or Total Maximum Daily Loads (TMDLs), which are considered a driving force for trading programs, are usually set for small watersheds. The Chesapeake Bay Region is an exception.

Sizing up the Evidence

A variety of trading and other market-like programs have been created over the past 20 years. Failure to address the challenges identified above is a reason why many of these programs have been short-lived or have not resulted in much trading activity (Breetz et al., 2004). There are also examples of successful water quality credit trading programs. The Long Island Sound (CT) and Tar-Pamlico Basin (NC) trading programs both experienced relatively long lives and resulted in documented pollution load and cost reductions. The programs resulted in reallocations of pollution caps among PS and did not address the challenges posed by NPS runoff.

Alternatively, trading programs in the Miami Watershed (Ohio), South Nation River Basin (Ontario, Canada), Cherry Creek (Colorado), Beet Sugar Cooperative and Rahr Malting Pollutant Offsets (Minnesota), and Red Cedar River (Wisconsin) all involve both PS and agricultural NPS (Breetz et al., 2004). Some of the challenges associated with agricultural runoff have been addressed in these programs by creating an intermediary between credit sellers (NPS) and credit buyers (PS). Such intermediaries (referred to as aggregators, credit banks, or brokers) can reduce the transaction costs of finding trading partners, and credit verification and monitoring. Intermediaries may also potentially bear some liability for delivering pollution reductions specified in trading agreements. In existing programs, such intermediaries are a joint venture of the regulatory authorities and public and private entities. The funds used to purchase credits from agricultural NPS have been drawn from both PS and federal- and state programs. In other words, the programs are essentially hybrids between market-based trading programs and government-managed tax-and-subsidy schemes. The rules for selecting NPS projects to generate credits and for selecting prices that PS must pay differ among the programs, making some of them more like market-based trading and others more like government-directed offsets (Stephenson et al., 2005).

Conclusions

Unresolved Public Policy Questions

Water quality credit trading has been perceived by many as an alternative to command and control regulations. Yet, water quality regulation is a necessary driver for trades to occur. Thus, trading alone cannot solve the challenges posed by largely uncontrolled agricultural pollution. A number of important public policy questions have been raised as discussions of trading have occurred. For the most part these questions remain unanswered or various interest groups and governmental agencies have answered them differently. Among the questions are:

Do the political will and resources exist? Do federal and state decision-makers have the political will and resources to enforce regulatory caps on PS and NPS? This is a critical step because the value of a water quality credit is dependent on the enforcement of this cap. Without an enforced cap, there is nothing of value for potential market participants to trade (King & Kuch, 2003).

Will government define the right to pollute and the right to clean water? This question focuses on a key underlying issue in trading program design. In terms of trading, "you can't sell what you don't own". The answer to this question determines who pays and who benefits from trading. As noted, an example of the unresolved nature of this question is the debate over farmers' ownership rights to publicly funded BMPs. Opinions vary over assignment of property rights to private parties from publicly funded projects, raising questions about the water quality benefits from such "double-dipping." Allocating and enforcing property rights is a fundamental role of government. Are governments willing to reconcile property rights questions of this nature?

Will trading programs be accepted as equitable? Is it fair when one category of polluters – PS – have regulatory effluent limits placed on them while NPS are required to meet only program-specific baseline requirements? King and Kuch (2003) suggest that PS dischargers believe that there is an inequitable allocation of pollution rights to NPS dischargers.

Will market approaches for environmental goods or services be accepted? Some stakeholder groups oppose trading because they believe that it is inappropriate to put a price on natural and environmental resources and trade them in a market (Goodin, 1994; Hahn, 1989; Hahn & Hester, 1989; King & Kuch, 2003; Woodward, 2003). Some are suspect of market-based approaches and perceive trading as excluding environmental interests. Also, the terminology associated with water quality credit trading is not well understood by environmental, farming, and development communities. This may prevent them from effective participation in trading program development.

Where to from Here?

Recently, federal and state policymakers as well as some stakeholder groups have promoted market-based approaches to address the agricultural water pollution. We described some of these policy activities and raise the question: what can be expected from market-based programs, and specifically trading, in addressing the long-standing and difficult issue of water pollution from agriculture?

After assessing these challenges, we conclude that federal and state policymakers are expecting too much from trading as a tool to address NPS water pollution from agriculture. Since King's 2005, *Choices* article, institutions have made progress creating a more supportive trading environment. Nevertheless, the physical and regulatory context for agricultural NPS pollution does not match the conditions that economic theory suggests are needed for widespread trading to occur. The majority of agricultural sources do not face an enforceable cap. Thus, it is difficult to ascertain whether PS-NPS trades will create new water quality improvements. King and Kuch (2003) state that PS-NPS trades cannot achieve water quality standards in watersheds where the NPS dischargers are responsible for the bulk of nutrient discharges or where very large reductions in nutrient loading are necessary. The lack of documented success in water quality credit trading adds credence to the idea that there is a mismatch of theory and practice.

We believe that water quality trading in agriculture should continue to be explored and be field-verified for its use as a tool to reduce the costs associated with pollution reductions. However, in the interim, policymakers must reduce their expectations and reliance on market-based solutions until there is more evidence that validates that these programs can help meet pollution reduction goals. Policymakers must recognize that water quality credit trading in agriculture is still in its infancy and that the challenges identified are not yet well understood.

Ongoing trading efforts should be regarded as experiments. Increased attention must be paid to designing future experiments to better understand the physical, social, economic, legal, and policy considerations. This will require greater exchange among economists, physical scientists, policymakers, farmers, municipalities, community members, and other stakeholders. As a more thorough knowledge of trading as a tool to address agricultural water quality problems is gained, its potential for use to help meet public water quality goals increases.

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Farm Growth, Consolidation, and Diversification: Washington Dairy Industry

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The shrinking number of farms in the United States is well-documented. Between 1974 and 2002, the total number of farms in the United States declined by 21%. While this represented a large drop in the overall number of farms, the number of farms with milk cows declined much more dramatically, falling by 79% during this period (USDA/NASS, 2002). With four times as many milk cows per farm in 2002 than in 1974, it is obvious that the dairy industry has become much more concentrated. Further, the entire decline in number of farms with milk cows occurred in size categories with fewer than 500 cows. The number of farms with 500-999 milk cows grew by 36% and the number with 1,000 or more milk cows more than doubled. Changes in the State of Washington generally followed those of the Nation.

The growth in the number of the largest-sized farms creates the most intrigue for economists and policymakers alike. As one of the last bastions of nearly perfectly competitive production, does this growth in farm size hint at a major change in the historically competitive nature of agricultural commodity supplies? For example, in 2002, more than 30% of milk sales came from just 1.5% of dairy farms. This situation warrants careful attention since adverse environmental effects often accompany increases in farm sizes, particularly for confined animal operations.

While we know that significant changes are occurring in farm size, no one has yet identified which farms are growing or shrinking in size. Nor has anyone documented the extent of commodity diversification on farms of different size. Which farms grow? Do farms in the larger size categories actually grow the most rapidly? Or do medium-sized farms combine with other farms of comparable size to create new large organizations? Do farms in different size categories increase or decrease their levels of diversification over time?

To answer these questions, we examined longitudinal data from the Census of Agriculture in 1992, 1997, and 2002 for dairy farms in Washington. This is an important industry in both the state and Nation. In the United States, dairy products rank second among all agricultural commodities in value of production (USDA/NASS, 2006a). Washington ranks 10th in the nation in milk production and first in milk production per cow, while the value of milk production in the state also ranks it second in importance among all agricultural commodities (USDA/NASS, 2006b). The state's dairy industry is highly concentrated, but geographically divided. More than half the milk cows are located in two counties; Whatcom on the west of the Cascades and Yakima on the east. The demographics are changing with rapid movement of cows to the east side of the Cascades. Cow numbers in Yakima County grew by more than 30% between 1997 and 2002, while those in Whatcom County declined.

Sample Selection and Information Collected

For our analysis, we included all farms for which the owner checked farming as his/her main occupation and for which at least 50% of all agricultural income (not including government payments) came from the sale of milk and dairy products. As a result, 781 farms are included in our sample, representing 65% of all Washington dairies in the 1992 census.[1] We ranked the farms from lowest to highest in terms of agricultural sales and then divided them into 10 equally sized cohorts. In other words, each cohort had the same number of farms in 1992 with the smallest 10% of dairy farms in the state in

Table 1. 1992 agricultural sales.[a]

Cohort	Range		
1		<	95,000
2	95,000	–	155,000
3	155,000	–	215,000
4	215,000	–	270,000
5	270,000	–	325,000
6	325,000	–	405,000
7	405,000	–	505,000
8	505,000	–	685,000
9	685,000	–	1,085,000
10		>	1,085,000

[a] Because of data confidentiality conditions, these ranges are only approximate.

Cohort 1 and the largest 10% in Cohort 10. The approximate range of sales for each cohort is reported in Table 1. Where possible, we tracked individual farms in each cohort over the next two censuses. We also created new cohorts for entrants in 1997 and 2002, for a total of 12 cohorts.

We recorded each farm's tenure status, total agricultural sales (exclusive of government payments), and milk and dairy product sales in each census year that it appeared. Based on this information, we calculated the number of farms in production, the number that entered and exited, farm size distributional statistics (mean, median, standard deviation, skewness, kurtosis, and range of sales), and the percent of cohort farms in each of four diversification categories. The percent of total farm sales (exclusive of government payments) derived from milk and dairy product sales determined the diversification categories: (1) 90% or more, (2) 75 - 89.9%, (3) 50 - 74.9%, and (4) less than 50%.

1. *The remaining 35% of dairy farms consisted of retired and residential/lifestyle farmers.*

Figure 1. Annual growth rates.

Farm Growth

Mean growth rates of 1992 dairy farms that remained in production varied considerably both among cohorts and between censuses. After adjusting for inflation between the censuses, the dairy farms grew at an average compound rate of 1.6% per year between the 1992 and 1997 censuses and 1.1% per year between the 1997 and 2002 censuses, averaging 1.4% between 1992 and 2002.

Figure 1 shows the annual growth rates we computed for each cohort for the 5- and 10-year periods. The average size of the smallest cohort of dairy farms decreased over the 10-year period, while the average size of farms in the three largest cohorts increased substantially and steadily over time. Farms in the intermediate size ranges generally grew slowly and more erratically. Overall trends suggest that, as farm size increased, so did the corresponding growth rate.

Distribution of Farms within Cohorts

Farms were close to being uniformly distributed within most cohorts in 1992. Only in the largest cohort was the distribution of farms appreciably skewed. In this cohort, the majority of farms lay in the lower part of the range and only a small number of much larger farms resided in the upper end of the range. In successive censuses, as farms tended to grow in size, the surviving farms in all cohorts became positively skewed, similar to the largest cohort in 1992. This finding implies that a small number of farms in every cohort grew much more rapidly than others.

These results suggest that average cohort sales were particularly influenced by a small number of farms that grew rapidly within each cohort. In fact, in each of the five smallest cohorts, a majority of the surviving farms were smaller in each successive census than in 1992. Therefore, if used improperly, average farm size can result in very misleading conclusions.

Farm Size and Diversification

Because of the criteria used to select farms to include in the sample, no dairies in 1992 were in the most diversified sales class (with less than 50% of agricultural sales from milk and dairy products). As apparent from Figure 2, the smallest three

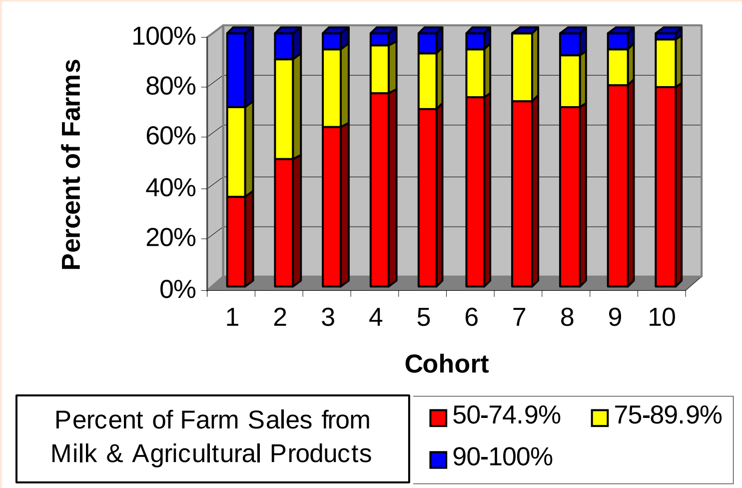

Figure 2. Farm diversification, 1992.

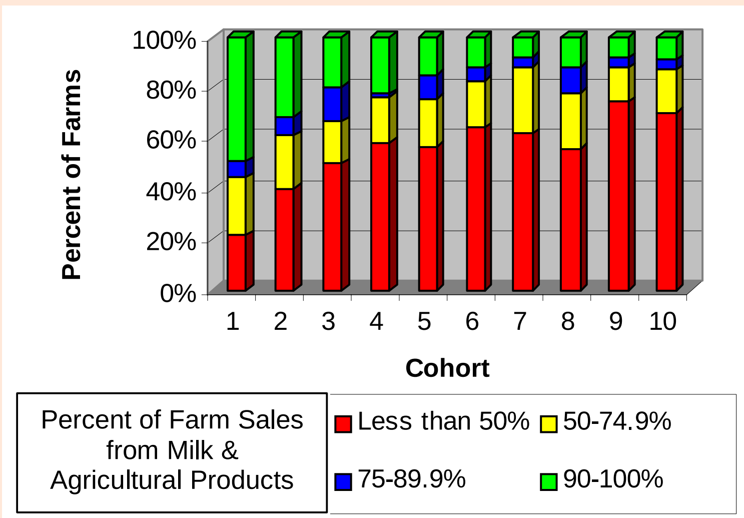

Figure 3. Farm diversification, 1997.

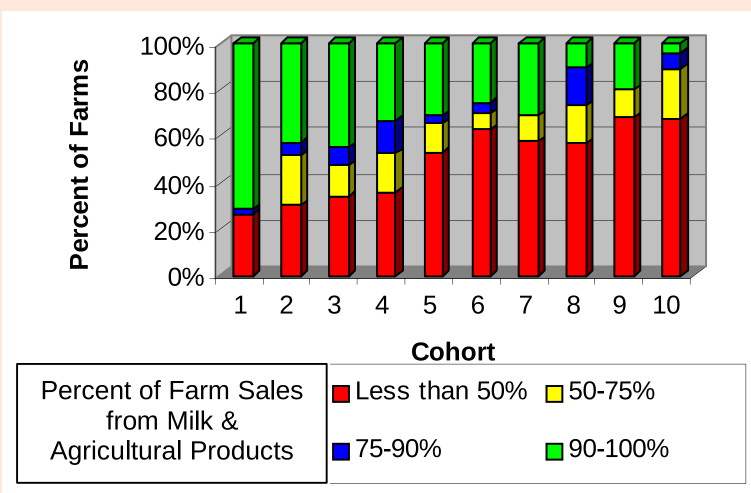

Figure 4. Farm diversification, 2002.

cohorts were the most diversified and all larger cohorts were more specialized.

In successive censuses, every cohort became more diversified. For example, the percent of farms that received 90% or more of their agricultural sales from milk and dairy products declined from 35% in 1992 to 27% in 2002 in Cohort 1 and from 78% in 1992 to 67% in 2002 in Cohort 10. Much more dramatic was the shift of farms to the most diversified sales class. By 2002, nearly 75% of farms in Cohort 1 received less than half of their agricultural sales from milk and dairy products, while none did in 1992.

Across cohorts, diversification followed roughly the same pattern in 1997 and 2002 as in 1992. The smallest cohorts were the most diversified and specialization increased with farm size (see Figures 2-4). We tested this graphical evidence by examining the correlation between farm size and level of diversification. Confirming our results, we found statistical evidence that as farm size increased, farms tended toward greater specialization. This tendency became stronger over time.

While the diversification trends between 1997 and 2002 followed those between 1992 and 1997, some caution should be exercised when interpreting the most recent statistics. Milk and dairy product sales do not include cull dairy cow or other cattle sales, and milk prices were lower in 2002 than in 1992 or 1997. Consequently, it is possible that part of the apparent increase in diversification in 2002 was due to a higher than normal culling rate induced by the lower milk price.

A further caution should be made about the diversification levels. We measure farm size by value of agricultural sales (exclusive of government payments), and our sample was selected to include only those farms for which milk and dairy product sales accounted for at least 50% of agricultural sales. Consequently, the most diversified farms with milk cows did not enter our initial sample. If they had been included, the evidence of diversification within the dairy industry would be even greater.

Farm Entry and Exit

Between each pair of censuses, more than twice as many dairy farms exited the industry in Washington as new farms entered. Smaller dairy farms tended to exit at higher rates than did larger farms. In Cohorts 1-7, an average of 3.5 farms exited for each farm that entered between 1992 and 2002. In contrast, an average of just over one farm exited for every farm that entered in Cohorts 8-10, implying a very low net exit rate. Further, the largest farms (Cohort 10) had fewer exits than entrants, which resulted in positive growth in the number of largest dairy farms.

Farms of all sizes entered the marketplace. However, their distribution and behavior differed widely from incumbent farms. While their mean size was much larger than the incumbents, falling between the means of the two largest incumbent cohorts, their growth rates tended to be much slower than the growth rates of the largest incumbents. They averaged less than 1% growth per year. They also entered the marketplace with a higher average level of diversification than any of the large incumbent farm cohorts in the initial sample and continued to diversify at a much more rapid rate.

What Does All This Information Mean?

This analysis of longitudinal agricultural census data for the Washington dairy industry has produced important insights about the relationship between initial farm size and both subsequent growth rates and the tendency to diversify. The largest group of cohorts is growing the fastest, suggesting that, despite earlier evidence that economies of scale were largely exhausted by 750-cow farms (e.g., Matulich, 1978), dairy farms in the state are not yet converging toward a size that minimizes average cost within the current size range. However, the fact that it was Cohort 8 rather than Cohort 10 that grew at the fastest rate does suggest that economies of scale may be diminishing for the very largest farms.

Additionally, we found that the larger the farm, the greater the tendency to specialize. In other words, larger dairy farms derived more of their revenues from milk and dairy product sales, while smaller farms turned to a more diverse range of outputs to generate their agricultural revenue streams. The only exceptions applied to new entrants. While their average size was very large at entry, they were much more diversified than large incumbent farms and grew much more slowly. However, the average level of diversification in all cohorts has increased over the 10-year period examined. This finding is particularly surprising for an agricultural commodity that has been one of the last bastions of the single-product farm.

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Fruit and Vegetables Go Back to School

by John L. Park, Benjamin L. Campbell, Andres Silva, and Rodolfo M. Nayga, Jr.

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Perhaps one of the most alarming trends plaguing our modern food system is the seemingly rampant increase in the prevalence of obesity across the United States. The Department of Health and Human Services reports that one in three adults is obese, and two out of three are considered overweight or obese. Even more alarming is the trend among children, where obesity rates have nearly tripled since 1980 (NCHS-CDC, 2006). Policy makers across the country have responded with efforts to drive foods of minimal nutritional value out of our schools and replace them with whole grains and fresh fruit and vegetables (Schmid, 2007; Zhang, 2007).

The resulting policies and programs may represent opportunities for marketers and producers of fresh fruit and vegetables to reach a growing market segment within our schools. However, it is not enough to simply provide an appealing product to students. Instead, successful marketers will appeal to the needs, perceptions, and preferences of those responsible for wholesale purchasing (Park, 2001). They need insight into the mentality of the school foodservice director. The effectiveness of these programs to improve dietary quality and presumably health is currently being debated. Externalities such as the influence of school foodservice buying habits and constraints may impact the effectiveness of these programs to achieve their stated objectives.

The Road to Obesity

To understand our present situation, let's step back and look at how we got to this point of a national health crisis. We believe that one major influence on our current predicament is the change that has occurred in our lifestyles. Think back fifty years ago—families generally consisted of two parents, and subsisted on one income. Family meals were prepared at home and enjoyed around the dinner table. The newspaper was a major avenue for the flow of information, and businesses competed with the guy across the street.

Fast forward to the present—the composition of the family unit has changed, as well as the economic conditions in which it operates. Today, meals of convenience are the norm, and businesses conduct operations on a global scale. Information is transmitted as quickly as ideas are developed. The widespread use of cell phones, text messaging, and the internet have compounded the amount of information available to an individual at any given point in time. Consequently, the modern consumer expects instant satisfaction and greatly values added services and conveniences. Not surprisingly, the food industry has shifted toward providing indulgent, value-added food products that are highly convenient (see Capps and Park, 2003, for further discussion of food marketing channels). When you put this together with the facts that U.S. consumers generally have less discretionary time, more discretionary income, and lead sedentary lifestyles, you get a recipe for obesity.

In a continual effort to provide consumers with products they want, food marketers are watching these trends closely. Some recent new product trends emphasize the use of wholegrain ingredients, while others offer portion control like Nabisco's "100 Calorie Packs." Even so, marketers continue to struggle to increase per capita consumption of fresh fruit and vegetables, despite continued reports on the associated health benefits (Wang & McKay, 2006). However, the public outcry over the poor state of school foodservice offerings may signal an opportunity for increased sales of fresh fruit and vegetables. In support of this, the government offers programs intended to improve the dietary intakes of school children while simultaneously supporting agricultural producers.

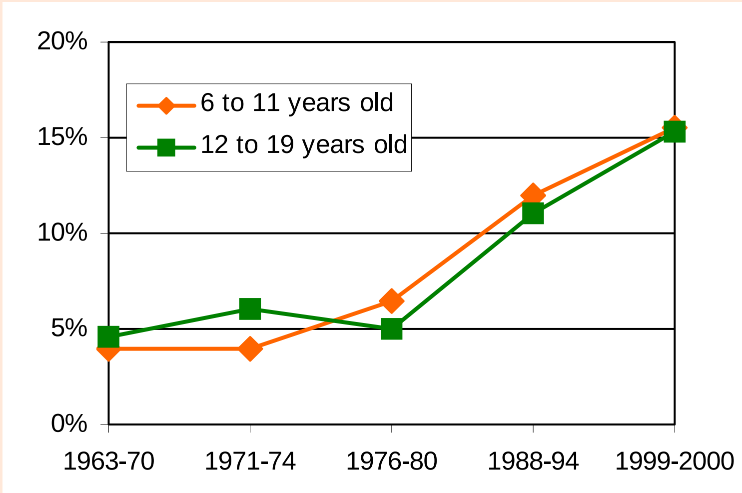


Figure 1. Percent of obese children.
Source: National Center for Health Statistics.

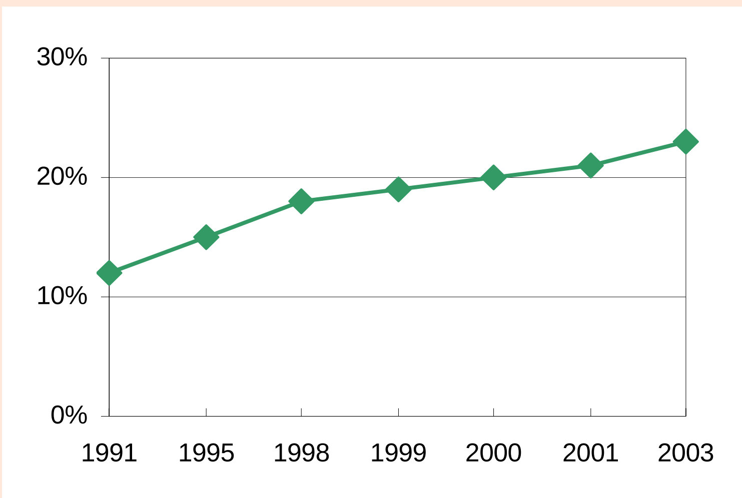


Figure 1. Percent of obese adults.
Source: National Center for Health Statistics.

Back to School

Most (if not all) school districts have a foodservice director that is in charge of purchasing food for the students within the district. Although their primary concern is providing lunch, many schools also offer breakfast and snacks. The foodservice director will combine funds available from state and local government as well as federal programs. In general, he/she can purchase products from whatever source he/she chooses; however, participation in certain government programs requires purchasing specific products through specific sources of distribution.

A variety of programs are available to help foodservice directors procure food for their schools. Such programs include the National School Lunch Program (NSLP) and the National School Breakfast Program (NSBP) among others. The NSLP and NSBP differ from some food aid programs in that they are available, at a slightly higher cost, to children who may not qualify for poverty-based assistance. The spending of these program funds are typically administered by a state department of agriculture.

The National School Lunch Program (NSLP) is the major government program that foodservice directors use to purchase their lunch foods. The NSLP provides nutritionally balanced low-cost, or sometimes free lunches to millions of children each school day. Since the inception in 1946, daily student participation in NSLP has grown from 7.1 million to 29.6 million in 2005, with approximately 100,000 schools participating. With regards to the NSBP, daily participation has grown from 1.8 million children in 1975 to 9.3 million children in 2005, with approximately 83,000 schools participating. Based on the large number of students using the NSLP and NSBP daily, their influence on nutrition, both in consumption and in establishing life-long behaviors, could be considerable.

There are also other programs that exist to encourage the consumption of specific food products in school programs. The Fresh Fruit and Vegetable Program, instituted by the USDA, reimburses schools for their purchases of fresh fruit and vegetables outside of those purchased as part of the NSLP. Initially available in 8 states, the program has been expanded, but funds are limited. For example, in Texas this program was made available to only 24 of the 7,203 schools that are eligible to participate in NSLP.

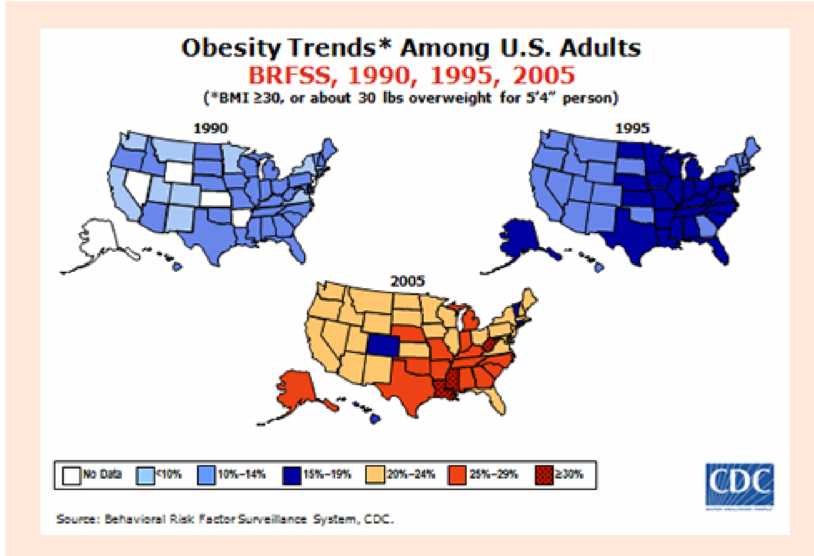
The methods school districts use to implement these programs go beyond putting nutritional foods on the menu. Some schools make these products available on demand, throughout the day. Finally, many states have initiated Farm-to-School programs in conjunction with federal programs. These programs help to keep federal funds within the state economy by allowing schools to buy produce from local growers at subsidized prices, sometimes only paying the cost of delivery (TDA, 2006).

Program Effectiveness

As part of the Centers for Disease Control and Prevention, the National Center for Health Statistics collects data through various methods in an effort to document the health status of the U.S. population. The information they gather is also an important part of research efforts to evaluate health policies and programs. However, quality of health is a complex issue. It can be measured in many different ways and is impacted by many different factors. For that reason, there is an abundance of research examining the effectiveness of these programs to provide only selected groups of nutrients at any one time.

Currently, we are examining data from the National Health and Nutrition Examination Survey (NHANES) to see if the NSLP and NSBP actually improve the consumption of fresh fruit and vegetables among school age children. Since obesity is rising and a large number of students eat at least one meal (lunch) and perhaps two meals (lunch and breakfast) at school each day, measuring the effectiveness of the NSLP and NSBP is extremely important in order to determine if the current guidelines are having an effect on healthy eating habits, particularly related to the consumption of fruits and vegetables.

Some preliminary results suggest that student participation in only the



NSLP has a positive impact on fresh fruit and vegetable consumption. However, student participation in the NSBP has a negative impact on fresh fruit and vegetable consumption (Campbell et al., 2007). Reasons behind these results are being investigated, but we need to remember that these results are influenced by the choices available to the students. For example, in the course of our research we were able to interview many different school foodservice directors. On one occasion, we ran across a reference to what foodservice personnel called "Hot Cheetos and cheese" that was sold to the students a la carte. The product involved taking a single serving bag of Flamin' Hot Cheetos (a popular brand of spicy extruded corn snack from Frito-Lay), pouring a scoop of melted nacho cheese over the contents, and putting a fork in it. This cheesy treat was a favorite among the students and provided the school district with sizeable revenue.

Although the product was admittedly unhealthy, the income that it generated gave the school district greater freedom and flexibility in operations. Any profit from the sale of a la carte items of this nature goes back to the district office, in essence increasing its budget. The rare opportunity of an actual profit center in a school foodservice program is a temptation that can completely undermine nutritional objectives. This illustrates how the factors surrounding the implementation of foodservice programs can confound the ability of national programs to achieve their stated goals. Further, we found it interesting that smaller nearby school districts also admitted to selling the Flamin' Hot Cheetos and cheese mixture, but stopped that practice due to nutritional concerns. From discussions with these foodservice directors, it was evident that their action might be due in part to a greater sense of accountability to parents and increased parental involvement with school administrators.

As a final note, researchers need to be aware of the Cheetos effect. Seemingly, conflicting results surrounding federal program initiatives may not be entirely due to the program, but also due to the conditions of its implementation. National surveys sometimes have difficulty in accounting for quality differences among the experiences of their respondents. In order to be more effective, policy makers and food marketers alike must be aware of the behavior of channel intermediaries like school administrators, in addition to the constraints they face.

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