An Analysis of the Economic Impact of Pennsylvania's Farmland Preservation Program

By

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Executive Summary

Agriculture is a critical industry in Pennsylvania, generating more than $7.7 billion in direct sales in 2017 from 59,000 farms and 7.7 million acres (USDA, 2019). Farmland covers 26 percent of the Commonwealth and agriculture is an important source of employment, earnings, and economic activity in both rural areas and several metropolitan counties. In addition, farmland provides valuable environmental benefits, such as wildlife habitat, flood mitigation, ground water re-charge, air pollution removal, and carbon storage and sequestration.

The loss of farmland raised concerns in Pennsylvania as far back as the 1960s. In 1988, a statewide referendum asked the voters of the Commonwealth whether they wanted to support a $100 million bond issue to purchase conservation easements from willing farmland owners. The referendum passed by a nearly 2-1 margin. In 1988, the state legislature passed Act 149 which amended Act 43 of 1981 to create the state/county farmland preservation program.

Today, Pennsylvania leads the nation in farmland preservation, with more than 550,000 acres and more than 5,300 farms preserved. Since 1989, the state government, 58 counties, several townships, and the federal government have invested more than $1.5 billion to purchase conservation easements from willing landowners. About $1 billion have come from state funds and more than $500 million from county matching funds. The farmland preservation program supports the state's agricultural industry, which is worth an estimated $135 billion in overall annual economic activity (Team Pennsylvania, 2018).

Overview and Study Objectives

As the Pennsylvania farmland preservation program enters its 30th year, this is the first formal analysis of its economic impact. The value of such an analysis is to

estimate the benefits to the agricultural industry, the state's economy, and the counties where the preserved farms are located.

To assess the contribution of the state/county farmland preservation program to the Pennsylvania state economy, the study estimates a multiplier effect and also estimates the annual contribution of preserved farms to the agricultural economy and the general economy of the state.

The dollar figures in this report are reasonable estimates; they are not meant to be precise measures. But they do give an indication of the overall economic activity that has resulted from the state/county farmland preservation program. If there is a bias in the figures, it is on the conservative side, especially compared to other studies of the economic value of land preservation.

There are four economic impacts associated with the state/county farmland preservation program:

1) Annual purchases of conservation easements from willing farmland owners and the direct and indirect economic activity that results from the spending of the conservation easement proceeds by the landowners. These activities include the purchase of farmland, equipment, inputs (seed, fertilizer), livestock, buildings, labor, and other farm services;

2) The direct expenditures on preserved farms in the form of farm product sales, wages, and landowner earnings;

3) The indirect and induced employment and spending that results from the purchase of farm inputs and spending by farm employees.

4) The environmental services that accrue from preserved farms, including water supply and water quality protection, flood mitigation, wildlife habitat, air pollution removal, carbon sequestration, and carbon storage.

The multiplier effect of the state/county farmland program was estimated in two ways: 1) estimating a multiplier number; and 2) estimating the direct, indirect, and induced economic activity from preserved farmland.

First, from 1989 through 2017, the state/county farmland preservation program spent a total of $1.5 billion on acquiring conservation easements to farmland. In 2017 dollars, adjusted for inflation, this means about $1.75 billion has been spent on acquiring conservation easements. The multiplier effect—how much direct and indirect and induced agricultural economic activity resulted from the purchase of the conservation easements—was estimated at between $1.62 to $2 for each dollar spent on conservation easements. The range of estimated multipliers are based on a traditional agricultural multiplier of about 2.64, minus leakages from the conservation easement payments for taxes, debt reduction, and other purposes not related to a farm operation. The 1.62 multiplier is based on the multiplier for agriculture reported by Team

Pennsylvania in their 2018 study. Thus, the impact of the farmland preservation program is estimated at between $2.835 billion and $3.5 billion.

This range of added economic activity does not include environmental benefits from improved soil and water conservation practices. An important feature of the Pennsylvania farmland preservation program is that it requires a preserved farm to have a soil and water conservation plan.

In 2017, conservation easements were purchased on 197 farms for a total of $59.3 million. Using an estimate of the multiplier effect at $2 for each dollar spent on conservation easements, or a total of $119 million.

Second, for 2017, the direct expenditures on all preserved farms in the form of farm product sales, wages, and landowner earnings were estimated at $582 million, using the methodology of two reports produced in 2011 and 2019;

The indirect and induced employment and spending that resulted from the direct spending and employment was estimated at $419 million.

The total estimated value of environmental benefits on preserved farms ranged from $906 million to $1.874 million.

The total economic impact of the state/county farmland preservation program in 2017 including the acquisition of conservation easements and the operation of all preserved farms was estimated at slightly more than $2 billion.

The first method of estimating a multiplier number appears to be more accurate. The second number depended on a five-county area around greater Philadelphia, where in 2011 only Chester County had preserved a significant amount of farmland and the county and a much larger agricultural economy than the others. The 2019 study focused solely on Chester County and was used in the current study to update the environmental value of preserved farmland.

Finally, the methodologies and data used in this study will enable future researchers to easily update the economic impact of the state-county farmland preservation program. Some important factors will vary from year to year, such as the state and county funding for farmland preservation, the number of farms and acres preserved, and the value of agricultural output of preserved farms. Similarly, the multiplier effect may require new estimation over time. But as more farmland is preserved, the value of farmland in terms of environmental benefits will surely increase.

Recommendations

1. State farmland preservation dollars have generally gone to the state's leading counties in agricultural output. This indicates that the state spending is being properly allocated for overall economic impact, and the state should "stay the course." Six of the

ten leading counties in farmland acres preserved are also among the top ten counties in value of agricultural production.

2. The State of Pennsylvania should note the multiplier effect of the farmland preservation program. Conservation easement dollars are often reinvested in the farm operation and that investment circulates through the local and state economy, generating about two dollars of direct and indirect economic activity for each easement dollar. The State of Pennsylvania should recognize the multiplier effect of preserving farmland in its publications and communications.

3. The state program should consider revising its program guidelines to require counties to place a weighting of 20% on the value of output for a farm in their application ranking systems. The program should be attempting to preserve more farms with over $100,000 a year in gross sales. In the 1990s, the state program had a requirement that a farm have or be capable of having $25,000 a year in gross sales. The 20% weighting would not exclude smaller farms but would favor the preservation of larger commercial farm operations. Preserving larger farms would generally have a larger economic impact than preserving smaller farms.

4. Counties should be encouraged to examine the municipal property tax rates compared to the acres of preserved farmland in their townships. Data n this study suggest there may be a relationship between acres of farmland preserved and lower municipal property tax rates.

5. The environmental value of preserved farmland is significant. The environmental services from preserved farms include water supply and water quality protection, flood mitigation, wildlife habitat, air pollution removal, carbon sequestration, and carbon storage. The State of Pennsylvania should recognize the environmental benefits of preserved farmland in its publications and communications.

6. The branding of agricultural commodities that come from preserved farms could appeal to consumers and command a premium price, similar to organically produced crops and livestock.

7. Rather than wait 30 years for the next report on the economic impact of the state/county farmland preservation program, it would be wise to conduct such a study at least every 10 years. Such studies should occur shortly after the release of the latest USDA Census of Agriculture, which provides a wealth of information at the state and county level on land in farms, the value of agricultural output, and farms by acreage and value of agricultural output. The annual reports of the Bureau of Farmland Preservation also provide valuable information on the performance of the state/county preservation program. In addition, new studies of the value of preserved farmland, property tax rates and levels and amount of preserved farmland, and agricultural multipliers can also be analyzed.

Introduction: The Importance of Agriculture in Pennsylvania

Agriculture is a critical industry in Pennsylvania, generating more than $7.7 billion in direct sales in 2017 from 53,000 farms and 7.7 million acres (USDA, 2019). Pennsylvania has a diverse agriculture, but the dairy industry is pre-eminent (Deller et al., 2018a; 2018b). The state leads the nation in mushroom production and ranks among the top five states for sales of eggs, milk from cows, nursery and greenhouse plants, sod, and organically-grown food products (Team Pennsylvania, 2018).

The production of crops and livestock accounted for about 81,200 jobs as of 2018 (ibid., p. 5). Including food processing, manufacturing, and food-related industries throughout the Commonwealth brings the job total to 579,000 workers and $135 billion in annual economic activity (ibid.). In sum, Pennsylvania agriculture supports about one out of every ten jobs in the Commonwealth (ibid., p. 5).

Agriculture is also an important part of the state's heritage and tourism, outdoor recreation, and forestry industries. In addition, farms provide an array of environmental services including wildlife habitat, water quality protection, water re-charge, carbon sequestration and storage, and open space amenities.

The Structure of Pennsylvania's Farming Economy

The structure of Pennsylvania's farming economy has important implications for the state/county farmland preservation program. The program should seek to preserve the most productive farms, and the change from 1992 to 2017 presented in the following four tables reveals that large farms with $100,000 or more a year in gross sales and especially mega farms with $500,000 or more in gross sales, are dominating Pennsylvania's agricultural production. Thus, efforts to preserve these farms is an obvious strategy. This is not to say that small- to medium-size farms should not be preserved, but they should demonstrate an ability to contribute significantly to the agricultural economy, such as through gross sales of at least $25,000 a year.

Pennsylvania has a wide range of topography, climate, and soils. Similarly, the Commonwealth's farms vary considerably according to size in acres and value of agricultural output (see Table A). Farms of 180 or more acres contain two-thirds of the state's farmland (see Table B). But 42 percent of the state's farms are less than 50 acres in size.

In 2017, mega farms with annual sales of $500,000 or more accounted for just six percent of the state's farms but two-thirds of the state's $7.759 billion in total farm output (USDA, 2019). Farms with annual sales of $100,000 or more accounted for over 90 percent of total farm product sales (see Table C). By contrast, small farms with sales of less than $10,000 a year made up just over half of the state's farms but less than one percent of the value of the state farm output.

Table A. Pennsylvania Farms by Size and Product Sales, 2017.

Farm Size	Annual Farm Product Sales ($)	Number of Farms	Total Value of Sales
Mega	$500,000 & over	3,087	$5.181 billion
Large	$100,000 – $499,999	8,261	$1.984 billion
Medium	$10,000 – $99,999	14,809	$.523 billion
Small	Less than $10,000	27,000	$.065 billion
TOTAL		53,157	$7.759 billion

Source: Team Pennsylvania, 2018, p. 23, USDA, 2019.
Note: Team Pennsylvania used data that appeared before the 2017 Census of Agriculture, which was released in the spring of 2019.

In 2017, farms with net cash income of $50,000 or more accounted for the large majority of profitable farms, earning more than $2.5 billion (see Table D). But more than half of the farms in the state lost money.

Several changes in the structure of Pennsylvania's farming economy since 1992 are worth noting. Between 1992 and 2017 there has been an explosion in the number of farms of less than 50 acres, an increase of more than 10,000 farms and 200,000 acres (see Table B). Farms of 50 to 99.9 acres have also increased in number and acreage, while farms of 100 to 179.9 decreased by more than 1,000 and 140,000 acres. These numbers suggest a greater fragmentation of the farmland base.

Farms with sales of $1 million or more accounted for more than half of all farm product sales in 2017, up from about one-quarter of sales in 1992 (see Table C). Farms with annual sales of $100,000 or more made up 92 percent of all farm product sales in 2017, compared to 81 percent in 1992. In sum, farms with annual sales of $250,000 a year or more grew in number and in the percentage of sales. The number of farms with $100,000 to $249,999 in sales decreased by more than 1,000.

The percentage of farms earning $50,000 or more in net cash income in 2017 was nearly double the percentage in 1992: 37% to 19% (see Table D). While some of this increase can be attributed to inflation over those 25 years, the percentage of farms with $25,000 to $49,999 in net cash income and less than $25,000 in net cash income also decreased. From a farmland preservation and economic activity perspective, it would be desirable to give priority for preservation to farms with $50,000 or more in net cash income, and secondly in the $25,000 to $49,999 category. These farms are more likely to re-invest a conservation easement payment in the farm operation. Although net cash income can vary from year to year, it is not advisable to preserve farms that show a negative net cash income. The easement payment in such cases would tend to go to living expenses rather than re-investment in the farm operation.

Table B. Pennsylvania Land in Farms and Number of Farms by Size Class, 2017 and 1992.

	2017	% of State Farms, 2017	1992	% of State Farms, 1992
All Farms				
Acres	7,278,668		7,189,541	
Number of Farms	53,157	100%	44,870	100%
180 acres and above				
Acres	4,817,421		4,857,469	
Number of Farms	10,790	20.3%	12,619	28.1%
100 to 179.9 acres				
Acres	1,201,711		1,343,216	
Number of Farms	9,122	17.2%	10,167	22.7%
50 to 99.9 acres				
Acres	780,250		724,460	
Number of Farms	10,863	20.4%	9,969	22.2%
Less than 49.9 acres				
Acres	479,286		264,396	
Number of Farms	22,382	42.1%	12,100	27.0%

Source: USDA Census of Agriculture, 2017. State Reports. Pennsylvania, Table 9. 1992 Census of Agriculture.

Table C. Market Value of Agricultural Products Sold, 1992 and 2017 (in thousands of constant dollars).

	2017	% of State Sales, 2017	1992	% of State Sales, 1992
Number of Farms	53,157		44,870	
Value of sales	$7,758,884	100%	$3,570,191	100%
Farms with				
$1 million or more in sales	1,440		325	
Sales Value	$4,083,657	52.6%	$867,248	24.3%
$500,000 to $999,999	1,669		689	
	$1,140,123	14.7%	$464,823	13.0%
$250,000 to $499,999	3,231		1,707	
	$1,132,216	14.6%	$580,627	16.3%
$100,000 to $249,999	5,077		6,291	
	$867,330	11.2%	$958,715	27.6%
$50,000 to $99,999	3,621		5,241	
	$258,854	3.3%	$390,851	10.9%
$25,000 to $49,999	4,595		3,915	
	$163,098	2.1%	$139,873	3.9%
$10,000 to $24,999	7,108		6,199	
	$114,841	1.5%	$99,653	2.8%
Less than $10,000	26,416		20,503	
	$99,364	1.3%	$88,905	2.5%
TOTAL		101.3%*		101.3%*

Source: USDA Census of Agriculture, 2017. State Reports. Pennsylvania, Table 3.

1992 Census of Agriculture. Pennsylvania, Table 2.

* Does not equal 100% due to rounding.

Table D. Net Cash Farm Income, 2017 and 1992 (in thousands of constant dollars).

	2017	% of 2017 Net Cash Farms	1992	% of 1992 Net Cash Farms
All Farms	$2,233,676		$758,341	
	53,157		44,866	
Farms with Positive Net Cash Income	$2,760,827		$890,287	
	25,587	100%	24,345	100%
Farms with Net Losses	$527,151		$131,948	
	27,570		20,521	
Farms with $50,000 and above	$2,530,403		N/A	
	9,529	37.2%	4,745	19.5%
Farms with $25,000 to $49,999	$126,257		N/A	
	3,494	13.7%	4,466	18.3%
Farms with $10,000 to $24,999	$70,850		N/A	
	4,290	16.8%	4,649	19.1%
Farms with less than $10,000	$33,318		N/A	
	8,074	31.6%*	10,485	43.1%

Source: USDA Census of Agriculture, 2017. State Reports. Pennsylvania, Table 5.

1992 Census of Agriculture. Pennsylvania, Table 2.

* Adds up to more than 100% due to rounding.

There is a strong desire to ensure that Pennsylvania's agricultural industry continues to be a vibrant part of the state's economy and a foundation of the quality of life residents of the Commonwealth enjoy. Yet, changing market conditions pose challenges and Pennsylvania's metropolitan counties, which, produce more than half of the state's agricultural output, are under heavy development pressure (USDA, 2019).

Farmland preservation is one element in the effort to sustain and expand Pennsylvania's agricultural industry. The goals of farmland preservation include:

1) The protection of high-quality agricultural soils for future production;

2) The opportunity for locally-produced food and direct sales to consumers;

3) The preservation of a critical mass of farms and farmland that enable the farm support businesses to survive and thrive, thus maintaining local and regional agricultural activity;

4) The preservation of farmland in large contiguous blocks to keep conflicting development at a distance and enhance the local business climate for agriculture;

5) A source of funding for investment in farming operations to enable them to thrive over time;

6) Maintaining affordable land prices for new farmers to enter farming and for existing farmers to expand their operations;

7) Maintaining the scenic amenities that farmland provides;

8) Managing community growth and development; and

9) transitioning the farm to the next generation (Daniels and Payne-Riley, 2017).

This last purpose is of increasing importance because as of 2017 the average age of Pennsylvania farmers was 55 years old (USDA, 2019). This means that in the next 20 years, millions of acres will change hands and how the heirs or buyers of that farmland use it will have implications for communities across Pennsylvania as well as the state's agricultural industry.

Chapter 1: The Pennsylvania Farmland Preservation Program

In 1988, the voters of the Commonwealth approved a $100 million bond program to fund the preservation of farmland. The state legislature then passed Act 149 of 1988, making Pennsylvania the tenth state to create a farmland preservation program (American Farmland Trust, 2018). Farmland preservation happens through the purchase, donation, or bargain sale (part cash part donation) of a perpetual conservation easement on a farm. In the Pennsylvania state/county program, nearly all farms have been preserved through either the purchase or bargain sale of a perpetual conservation easement. Farmland preservation is a voluntary process in which a landowner willingly agrees to restrict the use of his or her land through a perpetual conservation easement in return for a cash payment and possible income tax and estate tax deductions (Daniels and Keene, 2018).

To preserve a farm through the state/county program, a landowner must first enroll the farm in an Agricultural Security Area. The Security Area offers landowners three benefits: 1) the township supervisors agree not to enact nuisance ordinances that would restrict normal farming practices; 2) there is greater protection against eminent domain actions by a government agency; and 3) the landowner becomes eligible to apply to the county farmland preservation program to sell a conservation easement.

The county farmland preservation board ranks the applications it receives each year according to each farm's soil quality, size, development potential, and proximity to a preserved farm. The ranking system determines what farms will be accepted for appraisals of conservation easement value and the order in which the easement value of the farms will be appraised. The appraisal of a conservation easement is a double appraisal; the value of a conservation easement is the difference between the appraised "fair market value," based on what the farm would sell for today and the value of the farm restricted to agriculture and open space by a conservation easement.

The county farmland preservation board then makes offers to landowners based on the appraised conservation easement values. The county board is not obligated to offer 100% of the appraised easement value. When a landowner accepts a county board's offer, the county program administrator has the easement agreement approved by the county commissioners.

A county may purchase a conservation easement with its own funds, which have been certified by the state, solely state funds, a combination of state and county funds, or multiple funds, including a variety of blends of state, county, local, federal, and private funds. For example, as of 2017, conservation easements were "divided into 1,110 county-owned, 1,728 commonwealth-owned, 2,262 jointly-owned agricultural conservation easements, 111 multi-funded easements and 46 easements funded jointly between a county and non-profit or local municipality" (PA Bureau of Farmland Preservation, 2018, p. 10).

If state funding is involved in the acquisition of the conservation easement, the county farmland preservation administrator then sends the conservation easement agreement and supporting documents to the Pennsylvania Bureau of Farmland Preservation. The Bureau reviews the easement agreement and then presents it to the State Farmland Preservation Board for their approval. After the Board gives their approval, a check is sent from the Bureau of Farmland Preservation to the county farmland preservation administrator. Next, the landowner and the county settle the conservation easement purchase. The landowner and the county sign the conservation easement and the landowner receives payment from the state and from the county, if county funds are involved. The conservation easement is then recorded in the county land records. Finally, the county has the responsibility to monitor and enforce the terms of the conservation easement (see Graziani and Petrella, 2018).

In the case of a purchase of an easement with only county funds, the county sends a copy of the recorded conservation easement along with an application for a reimbursement of easement-related expenses (especially appraisal, survey, and title insurance costs) to the Bureau of Farmland Preservation. The State Board then approves reimbursement expenses.

Preserved farmland is still private property with no right of public access. The landowner may sell the farm, lease it, or pass it on to heirs. The conservation easement generally allows any agricultural use, including new farm buildings. The conservation easement does not allow non-farm residences, commercial uses, or industrial activity. The conservation easement “runs with the land,” so if the land is sold or passed on to heirs, the restrictions in the conservation easement apply to the new landowners.

Landowners have used the easement payment for a wide variety of purposes:

1. To reinvest in the farm operation through purchasing equipment, the construction of new buildings, the purchase of livestock, and the acquisition of additional farmland;

2. To pay down debt;

3. To create or add to a retirement nest egg;

4. To cover medical and education expenses; and

5. Others, such as enabling the sale of the preserved farm to the next generation at a preferential price.

Also, combinations of two or more options are possible, such as using the conservation easement payment to pay down some debt and to purchase new farming machinery.

Landowners can receive the easement payment in a lump sum at settlement or in installment payments, either over five years or as an Installment Purchase Agreement (IPA) over 20 years, but not all counties offer the IPA. The five-year installment involves

a payment of part principal and part taxable interest; the IPA offers an annual principal payment plus tax-free interest. The installment approaches are ways for a landowner to reduce or defer tax liability and thus keep more of the easement payment or take advantage of the time value of money through tax deferment.

The conservation easement payment is taxed as a capital gain, rather than as ordinary income (Daniels and Keene, 2018). This means that a landowner can deduct the basis in the property before determining the capital gains liability (See Daniels and Keene, 2018 and Revenue Ruling 77-414). Basis is what the landowner paid for the property plus improvements minus depreciation. The tax rates and tax liability under capital gains treatment are less than the ordinary income tax rates and liability. The capital gains treatment thus enables more of the conservation easement payment to go to the landowner and hence to potential reinvestment in the farm operation.

It is important to note that in 2017, most of the state/county conservation easement purchases in Pennsylvania were bargain sales of part cash and part donation by the landowners (Bureau of Farmland Preservation, 2018); in other words, the landowners accepted less than the appraised easement value. A landowner can use the donation portion as an income tax deduction which can offset at least some of the capital gains tax liability.

Another way to defer capital gains taxes is for the landowner to use the conservation easement payment in a like-kind exchange under Section 1031 of the Internal Revenue Code. IRS private letter rulings have established that a conservation easement is real estate and hence the conservation easement payment can be invested in additional real estate involved in business, trade, or investment and capital gains taxes on the sale of the conservation easement are deferred until the preserved property is sold. It is important to note that the like-kind exchange has been used more than 200 times in Pennsylvania. Also, there are special rules for the use of a like-kind exchange and the assistance of an attorney trained in these exchanges is essential.

The State/County Program: An Overview of the History

The Pennsylvania farmland preservation program is a collaboration between counties and the Department of Agriculture and its Bureau of Farmland Preservation. The state allocates funds to counties each year according to a formula based on the amount of property taxes in a county and the amount of matching funds a county authorizes compared to other counties. From 1989 when the county-state program became active, through 2017, the state has spent slightly more than $1 billion and counties have added more than $500 million for farmland preservation, not including administrative costs. Townships have contributed more than $23 million and the federal government $34 million (Bureau of Farmland Preservation, 2018). State funding comes from dedicated sources including a state cigarette tax and a percentage of the state Environmental Stewardship Fund (ibid., p. 4). State funds are allocated to counties

based on each county's appropriation of matchlng funds and the level of property tax revenue.

This year, 2019, marks the 30th year of the Pennsylvania farmland preservation program. Fifty-eight of the Commonwealth's 67 counties have created farmland preservation programs. Pennsylvania leads the nation in the number of farms preserved at more than 5,300. Although Colorado has preserved more agricultural land than Pennsylvania, most of this land is ranchland and is not nearly as productive as Pennsylvania farmland. The Pennsylvania county-state program has preserved more than 500,000 acres (Bureau of Farmland Preservation, 2018) (see Table 1.1). Preserving farmland to ensure that it remains available for agricultural production is an important component of Pennsylvania's farming future.

Table 1.1 Pennsylvania Agricultural Conservation Easement Purchase Program History.

CALENDAR YEAR	STATE FUNDING	COUNTY FUNDING	TOWNSHIP CONTRIBUTION	FEDERAL REIMBURSEMENT	NUMBER OF FARMS
1989	25,000,000	3,417,138			1
1990	20,000,000	2,454,369			21
1991	21,000,000	3,973,515			87
1992	15,000,000	3,822,000			108
1993	19,000,000	5,082,442			169
1994	20,000,000	5,498,113			102
1995	21,000,000	5,792,476			91
1996	31,000,000	6,318,987		1,000,000	115
1997	35,000,000	7,404,865		270,000	155
1998	28,000,000	9,240,574		964,000	195
1999	70,000,000	16,367,116	1,543,282		149
2000	45,000,000	24,307,112	1,170,062		283
2001	47,000,000	23,730,741	353,000	368,700	308
2002	40,000,000	23,912,272	1,510,618	2,318,556	289
2003	40,000,000	25,630,314	1,117,499	3,584,163	249

2004	43,000,000	25,762,300	2,613,252	2,218,183	214
2005	36,000,000	26,236,539	1,315,623	2,467,500	210
2006	102,000,000	45,067,886	1,522,058	882,900	293
2007	40,000,000	37,263,323	3,042,332	736,719	350
2008	33,000,000	41,268,987	1,002,557	3,293,191	307
2009	23,000,000	27,664,185	1,289,577	3,805,479	232
2010	20,000,000	17,047,576	902,780	3,858,057	168
2011	22,000,000	16,546,150	322,966	1,570,087	133
2012	24,000,000	15,857,736	551,346	2,098,803	135
2013	33,000,000	15,433,043	277,000	2,792,673	167
2014	30,000,000	16,562,596	3,380,601	0	200
2015	30,000,000	17,703,423	350,054	0	160
2016	36,000,000	14,096,501	548,921	1,033,550	154
2017	36,000,000	17,210,765	719,752	692,100	198
2018	37,000,000	16,767,620	(tbd)	(tbd)	(tbd)
Total	**1,022,000,000**	**517,440,664**	**23,533,280**	**33,954,660**	**5,243**

Source: Pennsylvania Bureau of Farmland Preservation Annual Report 2017, p. 40.

The Leading Counties in Farmland Preservation and Agricultural Production

Although 58 of the Commonwealth's 67 counties have formed farmland preservation programs, farmland preservation is concentrated in a relatively small number of counties (see Figure 1.1). This reflects in part the fact that a relatively small number of counties account for the majority of the state's agricultural output.

The 10 leading counties in farmland preserved accounted for 60% of the state's total preserved acres in 2017, 57.5% of the state's agricultural output in 2017, and 58.3 percent of the expenditures on conservation easements (see Table 1.2). The farmland acres preserved in Table 1.2 would be much higher in Adams County, Chester County, and Lancaster County if they included the preservation efforts by the Adams County Conservancy (11,000 acres), the Brandywine Conservancy (33,000 acres) and the Lancaster Farmland Trust (30,000 acres). Three other counties (Bucks-$133.2m, Montgomery-$107.49m, and Northampton-$65.67m) accounted for 21.8 percent of

conservation easements purchase costs between 1989 and 2017. Thus, more than 80 percent of the farmland preservation program conservation easement funds have been spent in just 13 counties. All of these counties are located in the Southeast and South Central regions of the Commonwealth (see Figure 1.1).

The top ten counties in preserved farmland retained a slightly higher percentage of their farmland than the state as a whole (see Table 1.3), and six of the ten counties registered increases in the land in farms from 1992 to 2017. This increase is more likely a matter of how the USDA defines farmland as having the "potential" to produce agricultural commodities. The Census of Agriculture is based on a sampling of landowners rather than a Geographic Information Systems database or remote sensing—such as the NRCS employs in the National Resources Inventory to identify changes in land uses.

Figure 1.1 Number of Agricultural Conservation Easements by County, 1989-2016.

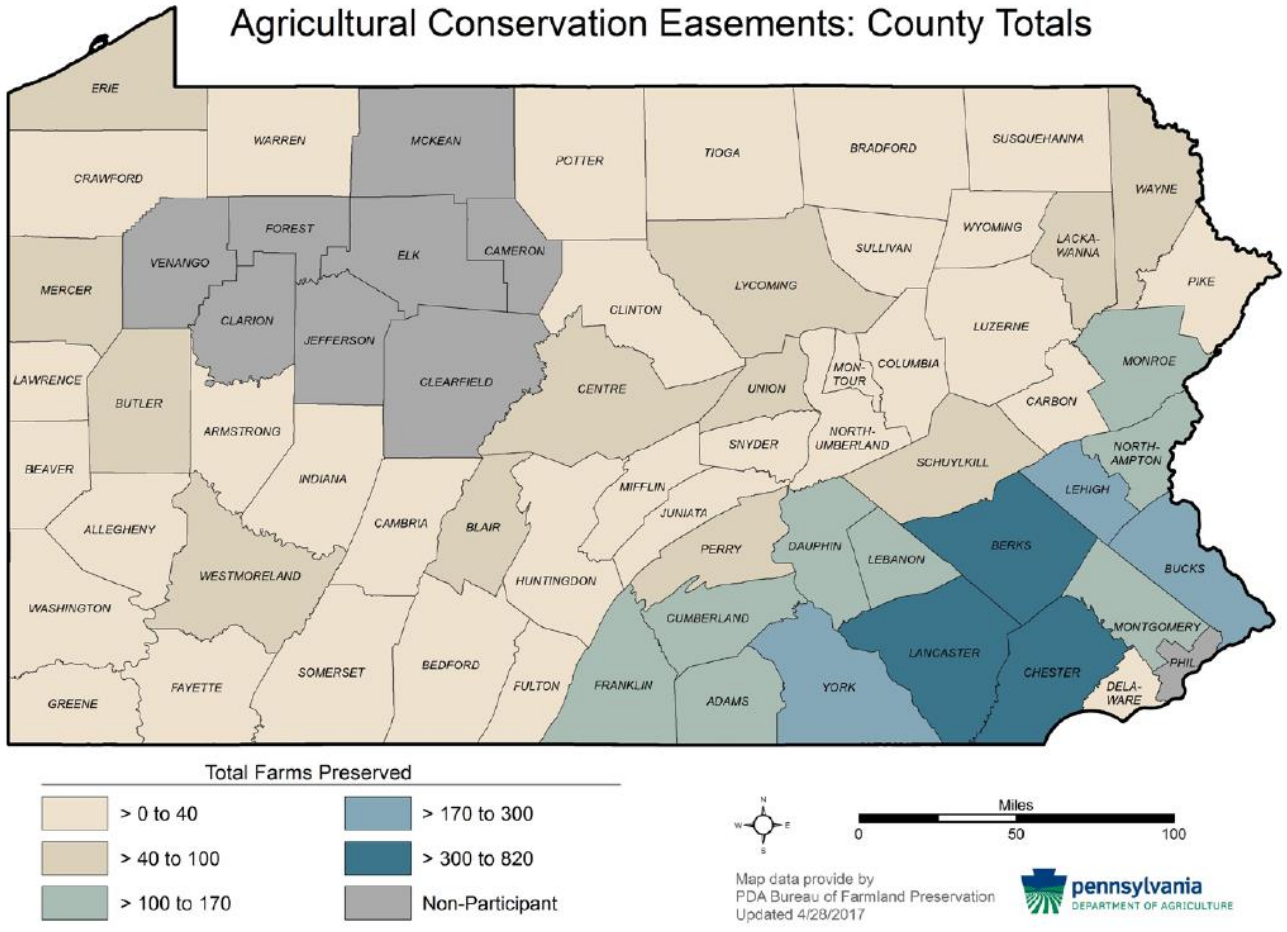

Table 1.2. Top Ten Pennsylvania Counties in Farmland Acres Preserved, Value of Farm Output, 2017, Easement Dollars Spent, 1989-2017 (in millions of 2017 dollars).*.

County	Acres Preserved	Value of Farm Output, 2017	Easement Dollars Spent, 1989-2017
Adams	22,045	$207.6m	$39.88m
Berks	71,862	$544.7m	$153.51m
Chester	27,804	$712.5m	$155.06m
Cumberland	18,052	$219.2m	$48.29m
Dauphin	16,905	$93.1m	$23.56m
Franklin	17,299	$476.5m	$32.63m
Lancaster	70,651	$1,510m	$182.23m
Lebanon	18,494	$350.8m	$32.11m
Lehigh	23,145	$79.2m	$76.42m
York	41,636	$260.9m	$75.11m
TOTAL	**327,893**	**$4,454,500,000**	**$818.80m**
State Total	**544,892**	**$7,758,884.000**	**$1.403.63m**

Source: Bureau of Farmland Preservation, 2018; USDA, 2019.

*Note: Acres preserved through the state/county farmland preservation program. The acres preserved do not include farmland preserved by land trusts or before the creation of the state/county program in 1989.

The top ten counties in farmland preserved include six of the state's top ten counties in value of agricultural output. The other four leading counties in the value of agricultural production are Snyder at $200 million, Perry at $172 million, Northumberland at $154 million, and Union at $147 million.

Perhaps more telling for farmland preservation, in 1992, the top five Pennsylvania counties in farmland acres preserved made up 40.5 percent of the state's total farm output and in 2017, these counties accounted for 41.8 percent of the state's farm output. The top ten counties in farmland preservation had 53.6 percent of the state's farm output in 1992 and 57.5 percent in 2017. Also, the ten counties had a greater percentage increase in the value of their farm output than the entire state, measured in 2017 dollars (see Table 1.4).

Table 1.3 Top Ten Pennsylvania Counties in Farmland Acres Preserved, Change in Total Farmland Acres, 1992-2017.

County	Acres, 1992	Acres, 2017	Acreage Change	%Change
Adams	172,366	166,227	-6,139	-3.5%
Berks	221,981	224,722	+2,741	+1.2%
Chester	176,645	150,514	-26,129	-14.8%
Cumberland	141,919	169,654	+27,735	+19.5%
Dauphin	90,298	81,252	-9,046	-10%
Franklin	234,391	269,530	+35,139	+15%
Lancaster	388,368	393,949	+5,581	+1.4%
Lebanon	104,519	107,577	+3,058	+2.9%
Lehigh	82,982	74,511	-8,471	-10.2%
York	252,052	252,713	+661	+.3%
TOTAL	1,865,521	1,890,649	+24,928	+1.3%
State Total	7,189,541	7,278,668	+89,127	+1.2%

Source: Bureau of the Census, 1994, Census USDA, 2019.

The concentration of preserved farmland and agricultural output in a relatively small number of counties is important for estimating the economic impact of the farmland preservation program at the county level. Simply put, the more farmland that is preserved in a county and the larger the agricultural output, the greater the circulation of easement dollars and multiplier effect is likely to be in the county. For instance, in a county with little agricultural activity, say, under $25 million a year and less than 20 preserved farms and less than 5,000 acres preserved since 1989, the economic impact on the county economy (hence the multiplier effect) is likely to be small (see Table 1.5). Also, leakage of easement dollars to outside the county is likely to be high. If a landowner is looking to reinvest some or all of the conservation easement proceeds in the farm, the landowner may have to purchase inputs, such as machinery, from outside of the county. By contrast, in counties with large agricultural sectors, say, over $100 million a year in output, there are likely farm support businesses within the county where the landowner can purchase inputs (feed, seed, livestock, machinery, building supplies, etc.). And more of the economic activity associated with the spending of conservation easement proceeds will likely occur within the county.

Table 1.4. Top Ten Pennsylvania Counties in Farmland Acres Preserved, Inflation-Adjusted Value of Farm Output, 1992-2017 (in millions of 1992 dollars).

County	Value of Farm Output, 1992	Value of Farm Output, 2017	Dollar Change	Percentage Change
Adams	$124m	$138m	$14m	+11.3%
Berks	$238m	$370m	$132m	+55.5%
Chester	$283m	$475m	$192m	+67.8%
Cumberland	$76m	$146m	$70m	+92.1%
Dauphin	$49m	$62m	$13m	+26.5%
Franklin	$169m	$317m	$148m	+87.6%
Lancaster	$681m	$1,005m	$424m	+62.3%
Lebanon	$132m	$233m	$101m	+76.5%
Lehigh	$43m	$53m	$10m	+23.3%
York	$120m	$174m	$54m	+45%
TOTAL	$1,915m	$2,973m	$1,058m	+55.2%
State Total	$3,570m	$5,173m	$1,603m	+44.9%

Source: Bureau of Farmland Preservation, 2018; USDA, 2019. St. Louis Federal Reserve Bank. 2018. GDP Price Deflator, https://alfred.stlouisfed.org/series?seid=GDPDEF

As of 2017, 30 of the 58 counties participating in the state/county farmland preservation program had preserved less than 5,000 acres; 18 counties had completed fewer than 20 conservation easement transactions; 12 counties had less than $25 million in gross farm product sales in 2017, and another 11 counties had less than $50 million in gross farm sales (see Table 1.5).

Table 1.5. Counties with Less than 5,000 Acres Preserved, Less Than 20 Conservation Easements, and Less Than $25 million in Gross Farm Product Sales in 2017.

County	Less than 5,000 acres Preserved	Less than 20 Conservation Easements	Less than $25 million in Gross sales	Less than $50 million but more than $25 million
Allegheny	X		X	
Armstrong	X	X		X
Beaver	X		X	
Bedford	X	X		
Bradford	X	X		
Butler				X
Cambria	X	X		X
Carbon	X		X	
Centre				
Clinton	X			
Columbia	X			
Crawford	X	X		
Delaware	X	X	X	
Fayette	X			X
Fulton	X	X		
Greene	X	X	X	
Huntingdon	X	X		
Indiana	X	X		
Juniata	X			
Lackawanna			X	
Lawrence	X			X

Luzerne	X		X		
Lycoming					
Mercer					
Mifflin	X				
Monroe			X		
Montgomery					X
Montour	X	X			
Northampton					X
Northumberland	X				
Pike	X	X	X		
Potter	X	X			X
Snyder	X				
Somerset	X	X			
Sullivan	X	X	X		
Susquehanna					X
Tioga	X	X			
Warren	X	X	X		
Washington					X
Wayne					X
Wyoming	X	X	X		

Source: PA Bureau of Farmland Preservation, Annual Report 2017, p. 39; USDA, Census of Agriculture 2017.

The impact of the farmland preservation program is likely to be greater in those counties that have: 1) preserved more than 15,000 acres and have more than $50 million a year in gross farm product sales. Of the 58 counties with farmland preservation programs, 30 have preserved less than 5,000 acres and among those counties that have preserved more than 5,000 acres, six have less than $50 million a year in gross farm sales (USDA, 2019). There are 21 counties that have preserved more than 5,000 acres and have more than $50 million a year in gross farm sales. The 10 leading

counties in farmland preserved accounted for 60% of the state's total preserved acres in 2017 and 57.5% of the state's agricultural output (PA Bureau of Farmland Preservation, 2018; USDA, 2019).

Finally, hundreds of preserved farms have been sold since 1989. An important concept behind the farmland preservation program is that the appraised value of a conservation easement plus the sale of the farm once it is preserved by a conservation easement should more or less equal the fair market value of the farm before the easement sale. This concept is important for protecting a landowner's equity and a lender's collateral. If, for example, a preserved farm sold for a price lower than the appraised preserved farm value, the landowner would likely not be pleased. County farmland preservation administrators reported anecdotally that farmers were generally very happy with the sale prices they received when they sold their preserved farms. This result has been important for gaining and maintaining landowner confidence in the state/county farmland preservation program. It also shows that preserving the farm through the sale of a conservation easement and the eventual sale of the preserved farm is a financially viable alternative to choosing not to preserve the farm and selling for development.

Chapter Two: The Economic Impact of the Pennsylvania Farmland Preservation Program

Measuring the economic impact of Pennsylvania's farmland preservation program is important for several reasons.

A) How much overall economic activity is resulting from the acquisition of conservation easements? What is the "multiplier effect" of farmland preservation payments? That is, how much economic activity occurs because of the public investment in preserving agricultural land?

B) Is there a relationship between the amount of farmland preserved and the economic performance of the Commonwealth's and a county's agricultural industry?

C) Is there a relationship between the amount of farmland preserved and local property taxes?

D) What are the environmental benefits of preserved farmland in dollar terms?

To answer these questions, the following data was compiled and analyzed:

1) Annual purchases of conservation easements from willing farmland owners;

2) The direct, indirect, and induced economic activity that results from the spending of the conservation easement proceeds by the landowners. The direct expenditures on preserved farms in the form of farm product sales, wages, and landowner earnings. The indirect and induced employment and spending that results from the purchase of farm inputs and spending by farm employees and owners of preserved farms.

3) Preserved farmland and agricultural economic performance by county;

4) A case study of township-level preserved farmland and property tax rates in Lancaster County;

5) The value of environmental services that accrue from preserved farms, including water supply and water quality protection, flood mitigation, wildlife habitat, air pollution removal, carbon sequestration, and carbon storage.

Other economic impacts exist, such as state and local tax revenues from preserved farms, the increase in value of properties that resulted from proximity to preserved farms, contribution to tourism, state income taxes from the sale of conservation easement, and the economic activity associated with the administration of the state/county program by the Bureau of Farmland Preservation and the individual counties. But these impacts were not included in this study because of the difficulty in estimating them.

Economic Activity Occurring from the Acquisition of Conservation Easements

From 1989 to 2017, about $1.55 billion was spent to acquire agricultural conservation easements (see Table 1.1). This figure is not adjusted for inflation. The GNP price deflator from the U.S. Bureau of Economic Analysis was used to adjust conservation easement funding for inflation. The period of 1989 to 2017 was a time of relatively low inflation. The total allocation for the acquisition of conservation easements in 1989 dollars was $1.114 billion and $1.75 billion in 2017 dollars (see Appendix One). The money spent on conservation easements circulates through the local and state economy in what is known as the Multiplier Effect. The Multiplier Effect for the purchase of conservation easements was estimated in a range from 1.62 to 2 (see below for a discussion of estimating the Multiplier Effect). So, for each dollar spent on acquiring conservation easements, a total of two dollars of economic activity within Pennsylvania were generated. With the $1.75 billion in 2017 dollars to acquire conservation easements from 1989 through 2017 and a multiplier effect of 1.62 to 2, the total economic activity attributed to the conservation easement purchase program was $2.835 billion to $3.5 billion.

The economic impact of the agricultural conservation easement purchase varies from year to year according to state and county appropriations and when the conservation easements are settled (see Figure 2.1. Figure 2.2 and Figure 2.3). Expenditures on conservation easements are not reported for every year in which they occur. Allocations of state funds, county funds, and other funds are reported (see Table 1). State funds granted to counties are available to be spent or encumbered for easement purchases for two consecutive county fiscal years (PA Code 7 § 138e.102(c). So, for example, state funds allocated in 1995 were available to counties through a county's 1996 fiscal year. Especially in the early years of the program, there was a lag time between the availability of state funds and the expenditure of the funds by the counties. In other words, in many cases a county did not spent all of its state or county funds in the year in which they were allocated. A county that does not spend or encumber its state allocation of funds within two years forfeits the state match funds, which are then re-allocated to counties that spent or encumbered their funds on time. Nonetheless, all state funds allocated have been spent.

The impact of the acquisition of conservation easements can be analyzed for the most recent year, 2017, in which conservation easements were purchased on 197

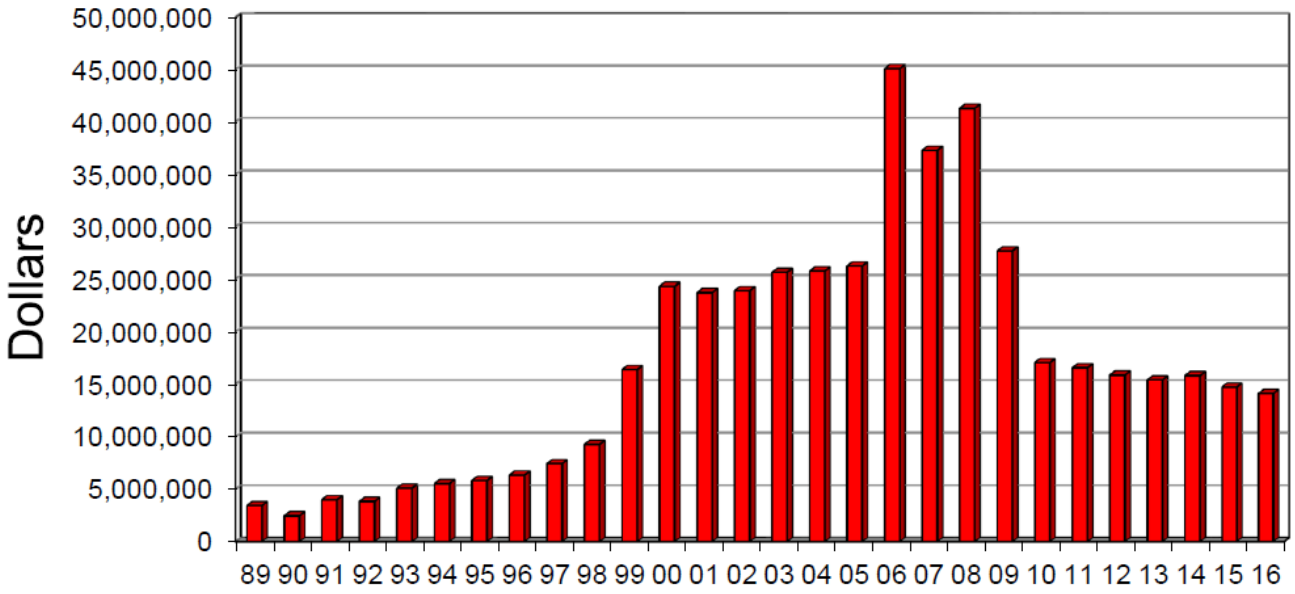

Figure 2.1 County Appropriations for Farmland Preservation, 1989-2016. Source: Bureau of Farmland Preservation Annual Report, 2016, Appendix, Figure 1.

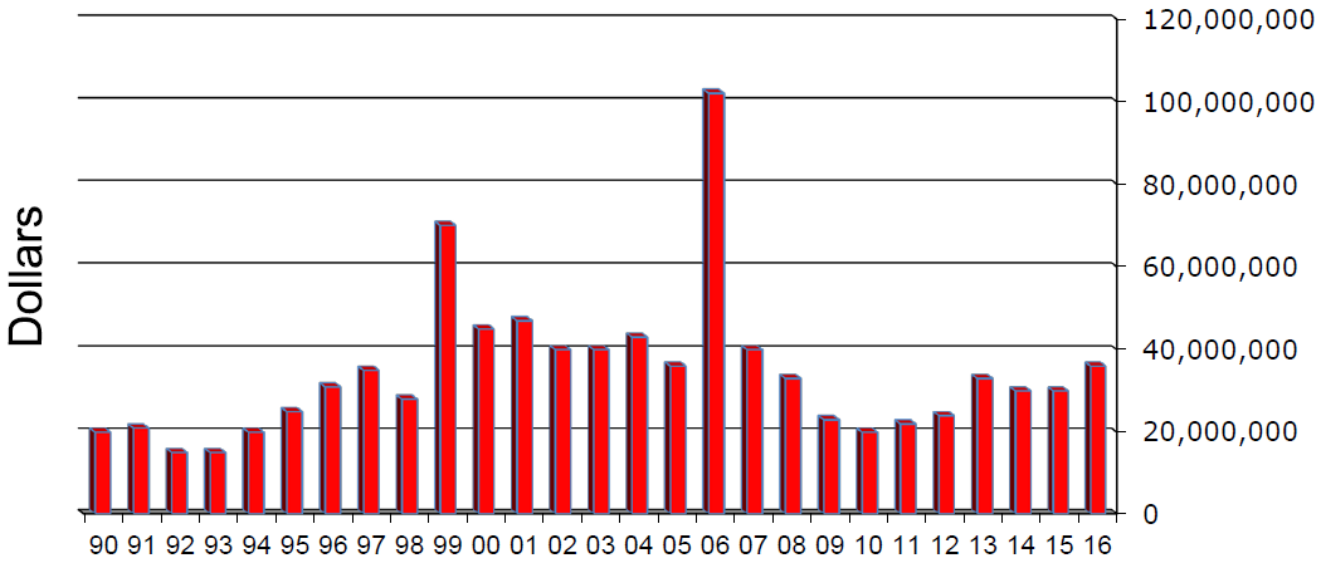

Figure 2.2 State Appropriations for Farmland Preservation, 1989-2016. Source: Bureau of Farmland Preservation Annual Report, 2016, Appendix, Figure 2.

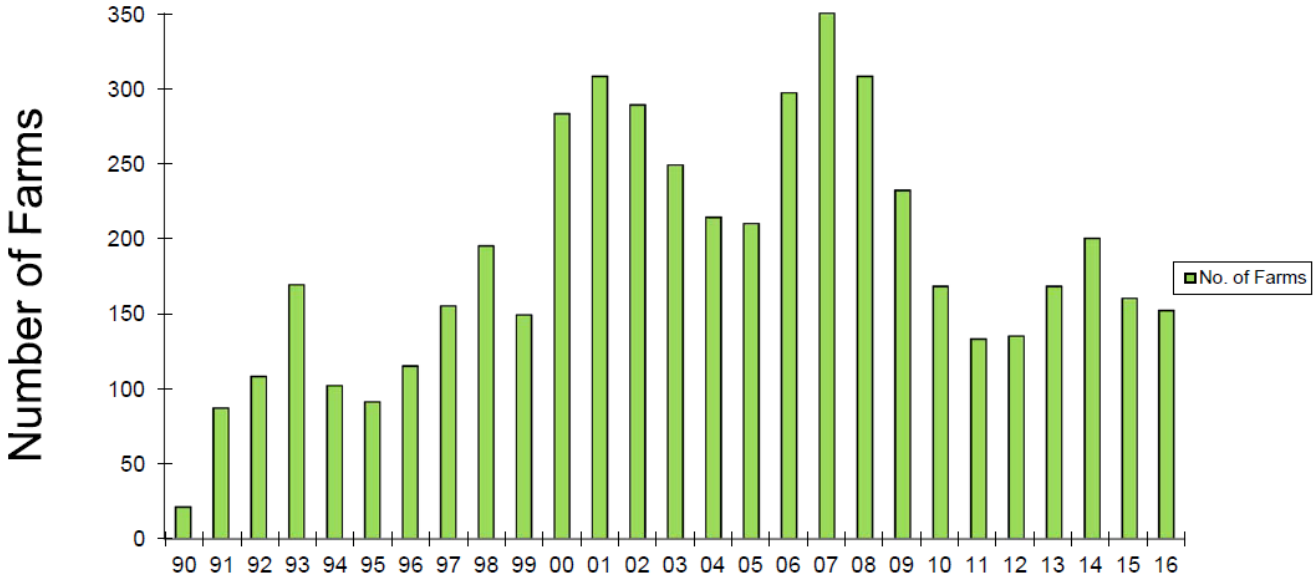

Figure 2.3 Farms preserved by year, 1990-2016.

farms for a total of $59.3 million (PA Bureau of Farmland Preservation, 2018, p. 33, Table 2). With an estimate Multiplier Effect of 2, the economic impact of the conservation easement purchase program was estimated at $119 million in 2017.

The Multiplier Effect of the Conservation Easement Purchase Program

A crucial component of any economic impact study is determining how much a dollar injected into the economic system circulates through that system, producing economic activity. The multiplier effect measures the amount of spending in the local or state economy--direct, indirect, and induced—that results from an extra dollar of initial spending or investment (Deller et al., 2018a, p. 1). In the case of conservation easement payments, direct spending Impacts are the value of the conservation easement payments that are spent on investing in the farm operation. The farm in turn adds to the local economy through the sale of farm products, paying wages and salaries to employees, and generating income to the farm owner.

These direct expenditures then lead to two other kinds of expenditures: indirect and Induced. Indirect expenditures are business-to-business transactions that result from intermediate purchases in the production of goods and services. For example, economic activity on preserved farms relies on farm support businesses, such as barn builders, feed stores, fertilizer and chemical suppliers, machinery dealers, veterinary services, and financial services, among others (Deller et al, 2018, p. 2).

Induced expenditures are generated through the spending of wages and salaries by farm employees and the spending of earnings by farm owners, such as on food,

clothing, and housing, among others. The purveyors of these goods and services in turn spend the wages, salaries, and earnings from these purchases on their own goods and services.

The multiplier effect eventually ends because of leakage out of the local or state economy. For instance, a farm owner may invest some or all of the earnings from the farm in the stock market in New York. An employee may spend the wages from the farm work on a trip to Florida.

Calculating the Multiplier Effect

The multiplier effect may be local, county-wide, or aggregated into a state-wide measure. There are three general ways to calculate the multiplier effect.

The first is through identifying a figure for a particular industry on which there is general agreement. Farming can be seen as a type of manufacturing as most farming operations today are capital intensive and produce an output of crops and livestock—even though these outputs typically go through further processing before they are sold to consumers. For instance, the multiplier effect for agriculture generally has slightly less than three times the economic impact for each dollar spent or invested in a farm operation. A 1984 study estimated the multiplier of agricultural production at 2.64 (US GAO, 1984, p. 5). Similarly, the Agricultural Issues Center of the University of California at UC Davis estimated in 2009 that a $1 billion increase of the value added from agricultural production and processing results in a total of $2.63 billion of gross state product, for a multiplier of 2.63 (University of California, 2012). In addition, each farming job generated 2.2 total jobs in the statewide economy. Deller et al. calculated a multiplier of just under 3 for the dairy industry in Pennsylvania, based on 2015 data (Deller et al., 2018a, p. 4). The Team Pennsylvania 2018 study estimated the multiplier effect of agriculture at 1.62 (Team Pennsylvania, 2018).

Different types of agriculture are likely to have different multiplier effects. For instance, a dairy operation is more capital intensive than a greenhouse operation, requiring more land, equipment, and building area, as well as livestock. The 2017 Annual Report of the Bureau of Farmland preservation noted the type of operations. Out of 197 farms preserved, 64 farms were primarily engaged in raising livestock (see Table 2.1).

The majority of farms preserved in 2016 and 2017 can be considered crop farms. In 2016 and 2017, raising row crops (such as corn or vegetables), hay, small grains (such as wheat), and pasture (see Table 2.2).

Table 2.1. Type and Number of Livestock Farms Preserved in 2016 and 2017.

Type of Farm	Number of Farms, 2016	Number of Farms, 2017
Dairy	30	39
Beef	15	19
Horses	3	4
Sheep	1	2
Swine	2	3
TOTAL	51	64
TOTAL FARMS PRESERVED	152	197

Source: Pennsylvania Bureau of Farmland Preservation, 2017 Annual Report, p. 12; 2016 Annual Report, p. 12.

Table 2.2 Type and Acreage of Crops Raised on Preserved Farms 2016 and 2017.

Crop	Acreage, 2016	Acreage, 2017
Row Crops	5,876	7,956
Hay	3,672	4,871
Small Grains	1,347	1,786
Pasture	1,346	1,623

Source: Pennsylvania Bureau of Farmland Preservation, 2017 Annual Report, p. 11-12; 2016 Annual Report, p. 12.

In the purchase of conservation easements, leakages that reduce the multiplier effect may occur because of how the landowners decide to use the easement payment. For example, a landowner may choose to use the easement payment to pay for medical expenses or send a child to college, establish or add to a retirement nest egg, or for some other purpose not related to the farm. The leakage limits the circulation of dollars in the local community, county, or state from the sale of a conservation easement.

In summary, measuring the multiplier effect of a dollar invested in a farm operation or the overall agricultural industry is important for gauging the total dollar impact of that initial investment. The multiplier effect will be different for different types of farms; and leakages reduce the size of the multiplier. This study attempts to determine a general multiplier for investments in agriculture and the multiplier effect of money spent to purchase conservation easements on farms, and leakages from those conservation easement payments (see Table 2.3).

Table 2.3 Factors That Support the Multiplier Effect of the Sale of a Conservation Easement.

Factor

1. The size of the farm operation. The larger the farm in terms of total farm products sold, the more likely the conservation easement payment will be re-invested back into the farm.

2. Age of the farm operator. Young (under 35) to middle-aged (35-55) farmers are more likely to re-invest in the farm operation. Older farmers, especially those over 65, are more likely not to use the easement payment to re-invest in the farm.

3. Farm operators with little debt. This means that most if not all of the easement payment can be re-invested in the farm operation, rather than paying down debt. In other words, there is little leakage that would reduce the multiplier.

4. The more farms that are preserved in a county in a year, the greater the demand for farm inputs is likely to be.

(Based on interviews with county farmland preservation program administrators and agricultural lenders).

Three main leakages from the multiplier effect of the conservation easement payments are: 1) paying down debt; 2) taxes on the easement payment; and 3) retirement savings and health-related expenditures. Leakages are often correlated with the age of the farmer; a farmer not yet at retirement age is more likely to use the easement payment to buy down debt; a farmer of retirement age is more likely to use the easement payment on retirement living expenses, rather than investing in the farm operation.

A survey conducted for this report of county farmland preservation administrators and agricultural lenders found that landowners used at least some of their conservation easement proceeds to pay down debt in one-third to as much as 60 percent of cases. They used one-third to half of the easement money to reinvest in the farm through new buildings or equipment; and another 20 percent to one-third of landowners used the easement funds to buy additional land. Very few landowners used the funds for other purposes not related to the farm.

By comparison, a study of 76 landowners' use of easement proceeds in Ohio from 2002 to 2007 found that one-third of the funds were used for investments in the farm—including buying more farmland—one third of the finds were spent on saving and personal investment, and one-third of the funds were spent on reducing debt (Clark, 2010).

Paying off debt does strengthen the balance sheet of a farm and can be seen as investing in the farm by reducing debt payments (Clark, ibid). Buying down debt would likely increase net farm income over time, which is a direct return to the landowner. In certain cases, agricultural lenders require some or all of the conservation easement payment to go to reducing debt in return for the lender signing a subordination agreement so that the conservation easement purchase can be completed. The subordination agreement means that if the lender were to foreclose on the landowner, the conservation easement would not be removed.

When debt is paid off, that portion of the easement payment typically goes to an agricultural lender, who then has additional funds to loan to the agricultural sector. Also, an easement payment may strengthen the financial position of a farm so that the landowner can borrow additional funds to invest in the farm operation. That additional borrowing ability is not normally reflected in the multiplier effect.

So, buying down debt is a form of leakage, but that leakage is likely to be small, given the reduced borrowing costs and resulting increase in landowner income over time.

As previously mentioned, the conservation easement payment is taxed as a capital gain. A landowner may be able to use the basis in the farm (price paid for the farm plus improvements minus depreciation) to offset some or all of the easement payment and reduce or avoid capital gains taxes. Tax rates on capital gains have varied over time and the rate an individual must pay depends in part on total income earned. Also, in a bargain sale of part cash and part donation, the donation portion can also help to offset capital gains tax liability. In general, younger farmers are often able to minimize or avoid capital gains taxes on the easement payment because of the high level of basis in the farm. Older landowners tend to have a low basis and will often owe at least some capital gains taxes unless they use the easement payment in a tax-deferred like-kind exchange.

To estimate leakages, interviews were conducted with county farmland preservation program administrators and agricultural lenders. Interview questions were approved by the Internal Review Board at the University of Pennsylvania. Only aggregate data are presented.

In general, landowners paid down debt in about one-third to half of all cases. Relatively few landowners used the payments for personal expenditures (such as a vacation). Some older landowners did use the easement money to invest in a retirement nest egg. Several landowners used the money to buy additional farmland, especially

through the use of a like-kind exchange under Section 1031 of the Internal Revenue Code. One-third to half of the easement proceeds were reinvested in the farm operation. Starting with an agricultural industry multiplier of about 2.6, I estimated that leakages reduced the multiplier effect of conservation easement payments to a range of 1.62 (the Team Pennsylvania estimate for the agricultural multiplier) to about 2.

A second way to estimate the multiplier effect is to estimate the direct, indirect, and induced effects that make up the multiplier. This approach is used in this study, mirroring the approach of a 2011 study that estimated direct, indirect, and induced effects within the five-county area of greater Philadelphia. This current study also estimates the overall economic activity attributable to preserved farms (see Chapter 4).

A third way to measure the multiplier effect is through an Input/Output model. This approach was not used in this study because of limitations of time, data, and cost. The Input/Output model can produce three multipliers: an output multiplier, an income multiplier, and an employment multiplier (Deller et al., 2018, p. 35). However, this report does follow the Return on Environment (2019) drafted by Econsult, Inc., which used input-output modeling to estimate spending, jobs, and earnings associated with preserved farmland in Chester County, Pennsylvania. In addition, this study follows the methodology in the 2011 Return on Environment report produced by the Greenspace Alliance and the Delaware Valley Regional Planning Commission. That report estimated the economic benefits of preserved farmland in the 5-county region of Southeastern Pennsylvania (Bucks, Chester, Delaware, Montgomery, and Philadelphia).

This study uses three measures of economic activity: employment, labor income, and farm output sales. Employment is the total number of jobs, not a full-time equivalent. Labor income includes wages, salaries, and farm owner income. Farm owner income is the farm owner's return on their labor on the farm. Farm output sales are value of crops and livestock sold. This study uses statistics from the 2017 Census of Agriculture.

The Relationship Between the Amount of Farmland Preserved and the Economic Performance of the Commonwealth and Individual Counties

Counties with more preserved farmland could be expected to have a greater increase in the value of agricultural output between 1992 and 2017. The more preserved farmland reflects a greater amount of money flowing into the county and its agricultural sector from the sale of conservation easements. With the assumption that some, if not most of the easement money is reinvested in the farm operation, the conservation easement payments are an important source of capital for the farm operation and can enable the farm owner to purchase better equipment, livestock, and other inputs to make the farm more productive.

Conservation easement expenditures by county 1989 to 2017 are compared to county farm output 1992 to 2017. Note that only 109 farms were preserved through the state/county program before 1992 (see Table 1.2). The top ten counties in farmland preserved include six of the state's top ten counties in the value of agricultural output (see Table 1.4). Adjusted for inflation, the top ten counties in farmland preservation experienced an increase of more than $1 billion (55.2%) in farm product sales between 1992 and 2017; whereas the State of Pennsylvania had an increase of $1.6 billion or 44.9%. The top ten farms in farmland preservation a 55.2% increase. The top ten counties accounted for two-thirds of the growth in the value of the state's farm output between 1992 and 2017.

In addition, it would be helpful to know how large the preserved farms are in terms of dollar sales (see Table A). That is, are preserved farms operated as commercial farms or as farms that rent land to commercial farms, or as a hobby farm with little to negative net income? One would expect that the larger the farm operation, the more likely the operation is a commercial venture and that the easement money would be reinvested in the farm. Specifically, the large and mega farms presented in Tables A and C made up 92 percent of the value of the state agricultural output in 2017. Preserving large and mega farms (i.e. farms with more than $100,000 a year in gross farms sales) should be an important strategy for the state/county farmland preservation program. But this strategy may be offset somewhat by the emphasis on the location of farms to create large contiguous blocks of preserved farms and to preserve farms under at least moderate development pressure.

The state's program guidelines for the farmland preservation program do not require that applicants report their gross income. In my review of completed easement purchases I was unable to find data on the gross income of the preserved farms. As a secondary approach, I examined the acreage of farms preserved in 2016 and 2017 and then compared them to farms preserved in 1997 and 2007 (see Table 2.4 and Table 2.5). The most common size of farm preserved in 2016 and 2017 was between 50 and 99.9 acres. The number of small farms (below 50 acres) was about equal to the number of larger farms (100 acres or more).

Table 2.4 Number of Preserved Farms by Acreage Size, 2016 and 2017.

		Size in Acres			
Year	<25	25 to 49.9	50 to 99.9	100 to 179.9	180 and above
2016	10	37	64	33	10
2017	23	30	87	44	13
All PA	<50				
Farms, 2017	22,382		10,863	9,122	10,790

Source: Bureau of Farmland Preservation Annual Reports, 2016 and 2017, 2017 Census Agriculture.

At the state level, however, farms of 180 and above acres made up about one-fifth of all farms, but less than 10 percent of the farms preserved in 2016 and 2017. The 100 to 179.9 acres category saw pretty much the same percentages for preserved farms and all Pennsylvania farms at 22 percent. The 50 to 99.9 acres category accounted for more than 40 percent of farms preserved in 2016 and 2017, but only 20 percent of all Pennsylvania farms in the 2017 Census of Agriculture. Farms of less than 50 acres made up 42 percent of all Pennsylvania farms but slightly less than one-third of the farms preserved in 2016 and 2017.

These results suggest a need for a greater priority to preserve farms of 180 or more acres.

In the years 1997 and 2007, farms of 50 to 99.9 acres were the largest category of preserved farms, accounting for about 40 percent of the preserved farms in those years (see Table 2.3). But there were many more farms of 100 or more acres compared to farms of less than 50 acres in both 1997 and 2007. And larger farms made up a higher percentage of all preserved farms in 1997 (50%) and 2007 (47%) than in 2016 (28%) and 2017 (29%). Larger farms could be expected to reinvest more of an easement payment in the farm operation. In sum, the shift toward preserving more small farms may signal a decline in the multiplier effect of the easement payments as a whole.

Table 2.5 Number of Preserved Farms by Acreage Size, 1997 and 2007.

	Size in Acres				
Year	<25	25 to 49.9	50 to 99.9	100 to 179.9	180 and above
1997	1	14	57	43	29
2007	7	25	105	101	22

Source: Bureau of Farmland Preservation, PA Farmland Database.

A review of more than 4,000 preserved farms from 1989 to 2018 provides a more fine-grained look at the size of farms being preserved by landowners and the number of landowners who have received more than $500,000 in easement payments (see Table 2.6). Table 2.6 presents the size of farms preserved by landowners who reserved more than one farm over the duration of the state/county farmland preservation program. It is important to note that nearly 300 landowners have preserved more than one farm, and

account for nearly 700 of the more than 5,000 farms preserved to date. Table 2.6 indicates that most of the landowners (176) who preserved more than one farm sold permanent conservation easements on more than 180 acres. Eighty-three landowners preserved 100 to 179.9 acres in more than one preservation transaction; and just 32 landowners preserved only 50 to 99.9 acres through more than one easement sale. The distribution of the sizes of preserved farms among landowners who preserved more than one farm differs markedly from the size distributions in 1997, 2007, 2016, and 2017. In those four years, the preservation of farms of 50 to 99.9 acres were the most common, followed by farms of 100 to 179.9 acres. But among landowners who preserved more than one farm, the 180 acres and above size category was the most common, followed by 100 to 179.9 acres, with the 50 to 99.9 acres category firmly in the minority.

Landowners who preserved two or more farms accounted for 68,675 acres of preserved farmland or about one-eighth of the farmland preserved under the state/county program. Finally, 101 landowners who sold more than one conservation easement received more than $500,000, a significant injection of capital if used to invest in their farm operations.

Table 2.6 Number and Percentage of Landowners Who Preserved More Than One Farm Through the State/County Farmland Preservation Program by Acres of Farmland Preserved.

	Size in Acres			
	50 to 99.9	100 to 179.9	180 and above	TOTAL
Number of Landowners	32	83	176	291
Percentage of All Landowners	11%	29%	60%	100%

Source: Bureau of Farmland Preservation, PA Farmland Database.

The Relationship Between the Amount of Farmland Preserved and the Municipal Property Tax Rate

The property tax is the main source of funding for local governments and school districts in Pennsylvania. Research conducted in 151 communities across the United States shows that the median cost to provide public services for each dollar of revenue

raised is $1.16 for residential lands and $0.37 for working and open land (TPL, 2018, p. 39).

In several cost of community services studies, the American Farmland Trust has argued that agricultural land pays more in property taxes than it demands in public services (American Farmland Trust, 2016). Studies in Vermont suggest that land preservation produces stable or even lower property tax rates because of the increase in the value of real estate next to preserved land (Highstead, n.d.). Conversely, most residential development demands more in public services than it generates in property taxes. According to this reasoning, farmland preservation is good municipal fiscal policy. In particular, those local governments with substantial amounts of preserved farmland could be expected to have stronger financial positions, reflected in the millage rate for property taxes. In other words, townships with more than 1,000 acres of preserved farmland could be expected to have a lower millage rate, other things being equal.

The other things being equal would mean the same total amount of farmland, population, the same zoning, and the same mix of residential, commercial, and industrial development. These factors, of course, vary from township to township. The test is to see if there is a correlation between the amount of preserved farmland and the millage rate for property taxes. Correlation is not causation; the test is an attempt to show whether there is a relationship between the amount of preserved farmland and the level of the millage rate.

To test this argument, 22 townships in Lancaster County were selected. The eleven townships with the most preserved farmland and eleven townships with the least amount of preserved farmland. The property value for tax purposes is assessed by the Lancaster County Tax Assessment Office. Tax rates then vary across townships, influenced by different township budget and school district budget levels. The school tax portion of the property tax accounts for the majority of revenue for each township. Townships with large amounts of preserved farmland are expected to have low property tax rates and hence low property taxes. The state of Pennsylvania offers preferential assessment of farmland through the Act 319 “Clean and Green” program. Virtually all preserved farms are in the Clean and Green program (see Chapter 5).

The Environmental Benefits of Preserved Farmland in Dollar Terms

There are many environmental benefits from preserved farms, such as water re-charge, the mitigation of floods and stormwater runoff, wildlife habitat, the removal of air pollution, and carbon storage and sequestration. These benefits are not traded in markets, but their value can be estimated in terms of avoided costs (Return on Environment Partners, 2019, p. 32).

This section follows the methodology of the 2019 report, Return on Environment, produced by Econsult, Inc. for the Return on Environment Partners based in Chester County, Pennsylvania (see Chapter 6).

Chapter Three: Literature Review of the Economic Impact of Farmland Preservation

A literature review of the economic benefits of farmland preservation can help to identify gaps in the literature that the current study might fill. The current study and the literature review can also point out future research needs.

The literature review focuses on three areas: 1) general benefits; 2) the multiplier effect associated with agriculture; and 3) environmental benefits.

Several studies have been conducted on the economic impact of land preservation (Econsult, 2011, 2019; TPL 2013, 2018). It is important to note that the economic impacts are likely to vary according to the type of land that is preserved. Also, the economic impacts of farmland preservation easement payments may be direct, such as increased investment in equipment and livestock, the purchase of inputs, and agricultural jobs on the farm; there are also indirect economic impacts, such as jobs in agricultural-related businesses off the farm and the open space the preserved farm provides for the state's tourism industry and the reality that homes that are closer to protected open space enjoy a more significant property value increase (Econsult 2010, p. 3). In addition, there are environmental benefits from farmland preservation that may be difficult to measure in dollar terms. For instance, a preserved farm must have a soil and water conservation plan. This plan can result in improved water quality, retention of forest land and wildlife habitat, and carbon storage and sequestration. Farmland helps with groundwater recharge and protects against flooding, especially compared to impervious surfaces (Econsult 2010, p. 5).

General Benefits

A benefit to landowners from selling a conservation easement is they can get cash out of their land without having to sell land. Landowners can use the easement payment for a variety of purposes. The benefit of farmland preservation to the community is an opportunity to manage growth by determining where future development should be located. Also, several studies suggest that preserving farmland can stabilize or reduce local property tax rates because of a more gradual increase in the cost of providing public services (American Farmland Trust, 2016; Highstead, n.d.).

The 2018 study by the Trust for Public Land on Vermont's return on investment in land conservation reported that for each dollar invested by the state in land conservation, $9 of benefits were generated. For farmland, the study pointed out two benefits that are often overlooked. First, the scenery provided by preserved farmland contributes to the tourism industry. Although this contribution is real, it was not estimated in this Pennsylvania farmland preservation study.

Second, land preservation assists in the transfer of a farm to the next generation of farmers (TPL, 2018, p. 24). The sale of a conservation easement provides funds that

a retiring farmer can use as a retirement nest egg and then sell the farm to the next generation at a price less than the fair market value based on development potential. This way, land preservation can help to keep farmland affordable (TPL, 2018, p. 25).

The subject of farmland affordability was beyond the scope of this current study on economic impact, yet it is an issue worth tracking. For instance, for several years, the Lancaster County Agricultural Preserve Board conducted a farm sales analysis of all farmland sold in the county each year. The sales were organized by size, location, zoning, whether preserved or not, and price. This data was very useful for appraisers in estimating the value of conservation easements on farms that were being considered for preservation by the Board, and in documenting the re-sale value of preserved farms. An initial concern among landowners was whether a preserved farm would retain much value. Evidence from Lancaster County through the 1990s was that preserved farms sold for almost as much as farms that were not preserved. It would be useful to have county-level databases on the re-sale value of preserved farmland.

What is the multiplier effect and how does it relate to Pennsylvania agriculture and farmland preservation?

The multiplier describes the additional economic activity generated by an investment in a particular industry. For instance, manufacturing is thought to have a multiplier of about 3. That is, for each dollar invested in manufacturing, three dollars of additional economic activity occur; the manufacturer must purchase inputs, such machinery and raw materials such as steel or plastic, pay workers fairly well to make goods, and then buy transportation services to distribute the finished goods. By comparison, retail trade has a low multiplier effect of less than 2; goods are transported to a store or warehouse and then sold directly to consumers. Worker pay in retail is generally lower than in manufacturing.

Agriculture is thought to have a multiplier effect of about 2.6 because it involves a production process, the growing of crops and livestock, and thus requires the purchase of many inputs and the transportation and processing of crops and livestock into food.

The 2018 Team Agriculture report concluded that “[f]or each job directly supported by Pennsylvania agriculture, another 1.06 jobs are supported across the Commonwealth. For each dollar of direct output, another $0.62 is generated in [indirect] economic impact” (Team Pennsylvania, 2018, p. 5). This would suggest a multiplier of 1.62, meaning that if the entire $1.5 billion spent on farmland preservation in Pennsylvania had been re-invested in the preserved farms, the preservation program would have generated about $2.43 billion in additional economic activity.

With any multiplier, there is a limit to how much new investment circulates through a local or state economy. This limit is caused by leakage. Leakage occurs in

several ways. In the case of a conservation easement payment for a preserved farm, leakage happens when:

1) State income and federal capital gains taxes are levied on the easement payment;
2) Part or all of the easement payment is returned as a debt payment to a lender; or,
3) The easement payment is simply not re-invested in the farm. This might include: using the easement payment to create a retirement nest egg; pay a health care expense; or send a child to college.

A marker for potential leakage is whether a landowner's lender has signed a subordination agreement as part of the conservation easement transaction. The subordination agreement means that if the lender were to foreclose on the farm, the conservation easement would not be removed. In short, a subordination agreement enables the county and state to protect its investment in the conservation easement. A subordination agreement does not mention how much of the easement payment the lender is requiring form the landowner/borrower in return for signing the subordination agreement. It is common for lenders to ask that the landowner give some of the proceeds from the sale of the conservation easement to the lender in order to buy down debt. In a few cases, lenders have requested the entire easement payment in return for signing a subordination agreement. In 2018, of 125 easements approved by the state of Pennsylvania, 76 involved a subordination agreement (Pennsylvania Bureau of Farmland Preservation, 2019).

Measuring the multiplier effect of a dollar invested in a farm operation or the overall agricultural industry is important for gauging the total dollar impact of the conservation easement payment. The multiplier effect will be different for different types of farms; and leakages reduce the size of the multiplier (see Table 2.2). This study will try to determine a general multiplier for investments in agriculture, the multiplier effect for different types of farms, the multiplier effect of money spent to purchase conservation easements to farms, and leakages from those conservation easement payments.

Environmental Benefits

The environmental benefits of preserved farmland have an economic value. These include water supply, flood mitigation, wildlife habitat, air pollution removal, carbon storage, and carbon sequestration. These benefits are typically non-market goods and services for which a dollar value can still be estimated.

Preserved farms in Pennsylvania are required to have a soil and water conservation plan. Conservation practices may include no-till, crop residue management, terraces, grass waterways, and stream buffers to reduce the runoff of

soil, nitrogen, phosphorus, and herbicides into waterways. Preserved farmland is thus more likely than unprotected farmland to improve water quality (TPL 2018, p. 15).

In its study of the value of land preservation in Vermont, the Trust for Public Land used the benefits transfer method. This method uses “the economic values of the different ecosystem types identified in th[e] literature to estimate a per-acre economic value of the natural goods and services provided. A conservative 5 percent discount rate was applied to determine the value of past and future cash flows” (TPL, 2018. p. 20).

Gaps in the Literature

The economic and environmental benefits of farmland preservation may change over time. For instance, in its 2019 study, Econsult placed a much higher value on carbon storage and sequestration that it did in its 2011 study. Similarly, the multiplier effect of farmland preservation may change according to the types of agricultural operation where farmland preservation takes place, the size of easement payments, and number of farms being preserved in a year in a county (the higher the number of preserved farms, the higher the multiplier will tend to be). There is a need for additional studies on the multiplier effects of different types of agricultural operations. Further studies of the relationship between the amount of preserved farmland and local property tax rates would also be helpful.

Figure 3.1 A Note on Fiscal Impacts

Fiscal impacts include local, state, and federal tax revenues that result from: 1) the payment for a conservation easement; or 2) the operation of a preserved farm – earnings from farming, wages and salaries of employees, and sales tax revenues from the purchase of equipment and inputs and property transfer taxes from the purchase of land.

An estimate of the fiscal impacts is beyond the scope of this current study. In addition, a fiscal impact analysis for the payments for a conservation easement raise some major privacy issues. The sale of a conservation easement is taxed as a capital gain. For the landowner selling the easement, this means that it is possible to deduct the basis in the farm (the original purchase price plus improvements minus depreciation) from the sales price of the conservation easement. In addition, some conservation easement sales involve a “bargain sale” of part cash and part donation. Without knowing the seller’s basis and the value of any donation, it is not possible to determine how much federal capital gains tax or state income tax the seller paid.

In addition, in the case of a “like-kind exchange” (Section 1031 of the Internal Revenue Code), a landowner can defer capital gains on the sale of a conservation easement by using an intermediary to put the easement proceeds toward acquiring any real estate involved in business, trade, or investment. The acquired property does not need to be farmland. No state or federal tax is due as result of the conservation easement transaction. Capital gains would be due if and when the property on which the easement is placed is sold. Pennsylvania had its first like-kind exchange with an easement payment in 1993. Since then dozens of like-kind exchanges have occurred.

It is possible to make a rough estimate of the total wages and earnings from preserved farms, the local income tax rates vary from zero in several rural townships to 3.8809 in Philadelphia, though they usually are one percent (Pennsylvania Dept. of Community and Economic Development, 2019). The state income tax rate is 3.07%.

The Pennsylvania sales tax is six percent. But determining which how much in sales taxes were paid for which farm inputs would be difficult. A variety of purchases of goods may be tax-exempt for farmers.

According to the Pennsylvania Department of Taxes, “generally, the purchase of tangible personal property to be used predominantly and directly in farming operations is not subject to sales tax. Also, the purchase of repair and replacement parts for machinery and equipment used directly in farming operations, and the labor charge for installation of such parts, is not subject to sales tax.”

Also, “tangible personal property purchased to construct, repair or maintain real estate or farm equipment is subject to tax. Real estate includes buildings such as houses, garages, barns, greenhouses, storage facilities, roads, dams, spillways and permanently installed fences, but does not include piping for irrigation or for livestock water supply, nor does it include drainage tiling.” See, Tax Information for Farmers: State and Local Sales and Use Tax: https://www.revenue.pa.gov/FormsandPublications/FormsforBusinesses/SUT/Documents/rev-1729.pdf.

The real estate transfer tax is two percent; the state charges one percent and the local municipality and school district charge another one percent.

Chapter 4: County and State Farmland Preservation and Economic Impact

This study involves two ways of estimating the multiplier effect associated with the state/county farmland preservation program. First, is to estimate a general multiplier for agricultural investment and then estimate leakages from the multiplier. Second, is to estimate the direct and indirect expenditures associated with conservation easement payments.

Over time, the economic impacts of Pennsylvania's state/county farmland preservation program appear in total expenditures, employment, and earnings from farming preserved farmland. Total expenditures consist of direct expenditures on goods and services and farm labor. This study focuses on estimates of the direct expenditures, employment, and earnings on preserved farms. Estimates of indirect expenditures, employment, and earnings are also provided. Together direct and indirect activity yields total expenditures, employment, and earnings on preserved farms (see Table 4.1, 4.2, 4.3 and 4.4).

Direct Expenditures

If a farm in a given county sells $1 million of its crops and livestock, a direct expenditure of $1 million goes into the county or state. Table 4.1 presents the acres of land in farms at the state level and three sample counties, the acres of preserved farmland, and the percentage of farmland accounted for by the preserved farmland. This percentage is used to estimate the value of farm output at the state level and in the three sample counties that can be attributed to the preserved farmland.

Table 4.1 Value of Agricultural Output on Preserved Farmland, 2017

	State Wide	Berks	Franklin	Lancaster
Land in Farms (Acres)	7,278,668	224,722	269,530	393,949
Preserved Farmland (Acres)	544,892	71,862	17,299	70,651
% of Farmland That is Preserved	7.5%	32.0%	6.4%	17.9%
2017 Market Value of Farm Output ($M)	$7,759m	$555m	$476m	$1,507m
Estimated				

Value of Farm Output on Preserved Farmland ($M)	$582m	$178m	$30m	$270m

Table 4.2 Value of Direct Employment in Agriculture on Preserved Farms, 2017.

Employment In Agriculture (Hired labor + Farm operators With positive Income from Farming)	82,309	4,169	3,590	11,137
Estimated Agriculture Full-Time Equivalent Employment on Preserved Farms	6,173	1,334	230	1,994

Table 4.3. Value of Direct Earnings from Agriculture on Preserved Farms, 2017.

Payroll + Net Farm Income	$1,136m	$94m	$53m	$152m
Payroll + Net Farm Income On Preserved Farms	$85m	$30m	$3m	$27m
Total Value of Farm Output and Payroll + Net Farm Income on Preserved Farms	$667m	$208m	$33m	$297m

Sources for Tables 4.1, 4.2 and 4.3: USDA, 2019, Census of Agriculture, 2017; Econsult et al. (2011, p. 128). This methodology could be used in any county that is participating in the state/county farmland preservation program.

The greater the amount of preserved farmland in a county, the greater the economic impact of the state/county program. For example, the state/county program has a larger impact in Berks County than in Franklin County. Even though Franklin has more total acres in farm use, Berks County has four times more preserved farmland.

The estimate of the value of output on preserved farms is on the conservative side because the state/county program generally has a minimum farm size of 50 acres. Parcels smaller than 50 acres may be preserved when they are adjacent to already preserved farms.

The Multiplier Effect and Indirect and Induced Expenditures, Employment, and Earnings

The multiplier effect describes the extent of the circulation of direct expenditures, in this case the sale of farm output in the form of crops and livestock through the county or state economy plus the size of the indirect and induced expenditures that result from the direct expenditures. Indirect expenditures come from farm-related businesses that service new demand for supplies and equipment related to the direct expenditures. Also, farm workers spend their earnings to buy goods and services within the county or state. In addition, there are indirect employment and earnings associated with the indirect expenditures.

The estimates of the indirect expenditures, employment, and earnings draws on the 2011 study by Economy League of Greater Philadelphia, Econsult Corporation, Keystone Conservation Trust, The Economic Value of Protected Open Space in Southeastern Pennsylvania.

In looking at the five-county region of greater Philadelphia, the researchers estimated the direct and indirect expenditures from 50,000 acres of preserved farmland. The direct expenditures (value of farm output) were estimated at $119.4 million and value of the indirect and induced expenditures was $86.2 million. In sum, indirect and induced expenditures were 72 percent of direct expenditures for an overall multiplier effect of 1.72. This indirect and induced expenditure level is very similar to the .62 level calculated by Team Pennsylvania, and the overall agricultural multiplier of 1.62. These multipliers are less than the 2.6 multiplier in the literature and especially in the report by Deller et al., 2018). It is further important to note that of the five counties, only Chester County had a significant amount of preserved farmland and Chester County's agricultural output in 2012 as well as amount of preserved farmland was greater than the other four counties combined. Thus, the multiplier effect estimated for the five-county region is likely on the low side because of the relatively weak agricultural industries in Bucks, Delaware, Montgomery, and Philadelphia counties. Again, note that the multiplier effect is likely to be greater in counties that have more preserved farmland.

Based on the 2011 study, I conservatively estimated the direct expenditures of preserved farms state-wide at $582 million in 2017. Using the 72 percent ratio of indirect to direct expenditures for preserved agricultural land in the 2011 study, I estimated the state-wide indirect expenditures at $419 million. Thus, total expenditures attributed to preserved farms are estimated at $1 billion for 2017.

Chapter 5: Property Taxes and Land Preservation: Is There a Relationship Between Preserved Farmland and Lower Property Taxes?

There has long been an understanding that farmland generates more in property taxes than it demands in services. The American Farmland Trust has sponsored several Cost of Community Services studies which have concluded that residential land demands more in public services than it generates in property taxes, while farmland pays in more in property taxes than it requires in public services (American Farmland Trust, 2016). The Trust for Public Land noted that studies in "15 Pennsylvania communities [have] found that open space and working farms and forest require only $0.18 in [public] services for every $1 generated in tax revenue while residential land requires $1.26 for every $1 generated" (Trust for Public Land, 2013, p. ii).

Similarly, a study by the Trust for Public Land in Vermont observed that:

> "Land conservation also saves Vermonters money through avoided costs on expensive infrastructure and other municipal services required by residential property owners, such as schools, police, and fire protection. A nationwide study found that the median cost to provide public services for each dollar of tax revenue raised is $1.16 for residential lands and $0.37 for working and open land. Similar work in Vermont found that, on average, property tax bills are lower—not higher—in the towns with the most conserved lands" (TPL, 2018, p. 6).

According to these studies, farmland is a net fiscal positive for a community. One way to test this understanding is to compare property tax rates in townships that have a large amount of preserved farmland, which qualifies for the Pennsylvania Clean and Green Program and offers farmland owners "use-value" assessment of their land at its agricultural value, rather than at its "highest and best use."

Twenty townships in Lancaster County were selected for a pilot study. Ten townships had the most preserved farmland in the county, and 10 had the least—not including Lancaster Township, which has no remaining farmland. The property tax rates in each township were compared, along with the population per township and the percentage of the township that was preserved farmland (See Table 5.1). Township property tax rates were provided by the Lancaster County Assessor's Office. Farmland acres preserved were provided by the Lancaster County Agricultural Preserve Board. The percentage of the township in preserved farmland was computed from the acres of preserved farmland in the township divided by the township total area. The population of the township was taken from US Census Bureau data. The school tax rate is constant at the township level across those townships that make up a particular school district.

Thus, the township millage rate is the important rate over which the township has control.

The results show that in the townships with large amounts of preserved farmland, the township millage rate is below 1.0 in six of the ten townships. In the townships with a low level of preserved farmland, the township millage rate is less than 1.0 in only three of the ten townships. A factor that can influence the township millage rate is the amount of commercial land and industrial land. These land uses typically produce more in property tax revenue than they demand in services and hence can help to offset the residential land uses which usually demand more in public services than they generate in property taxes. For example, East Donegal Township has a large amount of preserved farmland (7,393 acres) but also has a high millage rate (3.1165); by contrast, Manor Township has a similar amount of preserved farmland and population, but a much lower township millage rate (0.99).

In the remaining 20 townships in Lancaster County, there was no clear relationship between acres preserved and the township millage rate. Generally, a township with more than 8,000 people had a millage rate of more than 1.0.

Table 5.1. A Comparison of Township Property Tax Rates, Farmland Acres Preserved, Percentage of the Township in Preserved Farmland, and the Population of the Township in Lancaster County, PA.

High Acres Preserved Township	Farmland Acres Preserved	Area in Acres	%Area Preserved	Population (2017)	Millage Rate	School Rate
Colerain	3,678	18,144	20%	3,887	0.518	10.459
Drumore	3,842	15,379	25%	2,669	0.84591	10.459
East Donegal	7,393	13,715	54%	8,150	3.1165	18.167
East Drumore	4,788	14,803	32%	3,888	0.33	10.459
Fulton	5,198	16,506	31%	3,185	0.21	10.459
Little Britain	3,886	17,434	22%	4,236	0.301	10.459
Manor	7,590	24,531	31%	20,400	0.99	16.4
Mount Joy	4,140	17,818	23%	11,026	2.24	17.38
Penn	3,745	18,931	20%	9,787	1.4326	14.3317

Rapho	8,460	30,349	28%	11,400	1.37	14.3317

Low Acres Preserved Township	Farmland Acres Preserved	Area in Acres	%Area Preserved	Population (2017)	Millage Rate	School Rate
Bart	1,247	10,490	12%	3,250	0.475	10.459
Brecknock	1,113	15,917	7%	7,534	0.2563	12.3854
East Cocalico	643	13,075	5%	10,450	1.733	18.6935
East Earl	1,220	15,840	8%	6,720	1.7	12.3854
East Hempfield	1,077	13,485	8%	24,130	1.01	16.0034
East Lampeter	1,056	12,582	8%	17,079	1.9	13.394
Eden	862	8,019	11%	2,196	0.95	10.459
Manheim	510	15,277	3%	39,330	2.03426	15.1138
Paradise	1,023	11,974	9%	5,692	1.1082	14.6806
West Earl	406	11,360	4%	8,424	1.266	13.394

Other Townships	Farmland Acres Preserved	Area in Acres	%Area Preserved	Population (2017)	Millage Rate	School Rate
Caernarvon	2,270	14,694	15%	4,831	0.0117	12.3854
Clay	2,149	14,074	15%	6,680	1.17	16.95
Conestoga	1,365	9,370	15%	3,892	0.871	16.4
Conoy	2,404	9,318	26%	3,447	0.001	16.606
Earl	1,569	13,798	11%	6,854	0.978	12.3854
Elizabeth	1,774	11,130	16%	3,990	0.5	16.3711
Ephrata	2,047	10,394	20%	13,710	1.17	16.95

Leacock	1,374	13,152	10%	5,599	0.3168	14.6806
Martic	2,674	18,579	14%	5,246	0.51	16.4
Pequea	2,312	8,589	27%	4,700	1.567	16.4
Providence	1,315	12,723	10%	7,048	0.381	10.459
Sadsbury	1,598	12,518	13%	3,502	0.776	25.35
Salisbury	2,802	26,726	10%	11,310	0.001	14.6806
Strasburg	3,399	12,787	27%	4,250	2.86	16.644
Upper Leacock	1,322	11,597	11%	8,933	1.695	13.394
Warwick	2,966	12,653	23%	18,320	0.2325	16.3711
West Cocalico	2,642	17,485	15%	7,446	1.91	19.0
West Donegal	3,013	10,099	30%	8,600	1.6	16.6063
West Hempfield	2,885	11,808	24%	16,400	1.85	16.0034
West Lampeter	2,014	10,496	19%	15,978	0.9688	16.644

Source: Lancaster County Assessor's Office, US Census Bureau, Lancaster County Agricultural Preserve Board.

Counties in Pennsylvania can use the approach in Table 5.1 to compare municipal property tax levels with the number of acres of preserved farmland in a township.

Chapter 6: Environmental Benefits of Preserved Farmland

Preserved farmland provides many environmental benefits. These environmental services are not produced through markets and assigning a dollar value to those services is an estimate of the economic value of their benefits. The environmental benefits include water supply, flood mitigation, wildlife habitat, air pollution removal, carbon storage, and carbon sequestration. These benefits are typically non-market goods and services for which a dollar value can still be estimated.

The 2011 study of the economic value of open space in Southeastern Pennsylvania estimated the net present value of benefits of farmland preserved by the state/county program for water supply, flood mitigation, and wildlife habitat. The 2019 Return on Environment study drew "upon leading researchers that have evaluated many studies and, in most cases, uses an average value among the existing research to apply to this analysis. The values calculated in this economic research are based on the average consumer's "willingness to pay" for a service or activity. These estimates are not transaction-based; instead, they estimate the amount of money the average consumer would be willing to pay for a service or activity if it were not provided by protected open space. As such, the value estimates based on willingness to pay should not be understood as income or revenue, but rather as inherent consumer benefit gained from the free or low-cost services and opportunities provided by protected open space (Partners for Return on Environment, 2019, p. 35).

The environmental benefits of preserved farmland vary according to the type of land cover (Partners for Return on Environment, 2019, p. 54). Tree cover generally provides more environmental benefits than open land in terms of water quality, absorbing stormwater to mitigate flooding, and offering wildlife habitat. The 2011 study estimated the economic value of environmental benefits associated with preserved farmland (see Table 6.1).

Table 6.1 Estimated Economic Benefits of Water Supply, Flood Mitigation, and Wildlife Habitat on Preserved Farmland in the Five-County Region, 2011.

	Preserved		
Activity	Acres	Value per Year (millions)	Per Acre Value
Water Supply	42,035	$4.2m	$101
Water Quality (Waste Assimilation)	42,035	$1.5m	$36 (B7)
Flood Mitigation	42,035	$3.5m	$83 (B9)
Wildlife Habitat	42,035	$6.07m	$144 (B11)

TOTAL	$15.27m	$364

Source: Economy League of Greater Philadelphia, Econsult Corporation, Keystone Conservation Trust, 2011.

The estimates of benefits in the 2011 study were updated for inflation from 2010 to 2018 (15%) and applied on the preserved farmland on a state-wide and county basis. The estimate of water supply benefits reflects the fact that farmland offers considerable pervious surface area that can absorb precipitation into groundwater, some of which also becomes surface water. A watershed is the area that drains into a waterbody. Pervious land cover is better for water re-charge and minimizing water pollution than impervious coverage in roads, parking lots, and buildings. Farm stream buffers can intercept a variety of pollutants and eroded soil to assimilate waste and protect water quality. The estimate for flood mitigation will depend in part on the location of the preserved farmland. That is, how close is the farmland to a waterway and how close to cities, boroughs, and other developments that are vulnerable to flooding. Given the proximity of the five southeastern Pennsylvania counties to developed areas, the flood mitigation benefits of the preserved farmland in that region are likely to be higher than in the rest of Pennsylvania. By contrast, the wildlife habitat benefits of preserved farmland in more rural areas is likely to be higher than in southeastern Pennsylvania because of the greater variety and population of species.

The 2011 study was used as a basis for a 2019 study of the benefits of open space preservation in Chester County, Pennsylvania. Chester County is the leading county in farmland preservation among the five southeastern Pennsylvania counties studied in 2011 (see Table 6.2).

Table 6.2 Estimated Statewide Environmental Benefits of Farmland Preservation Program 2017/8 for Water Supply, Flood Mitigation, and Wildlife Habitat, Based on the 2011 and 2019 Studies.

Activity	Preserved Acres	Value per Year (millions)	Per Acre Value, 2018*
Water Supply	544,892	$63m - $101m	$116 - $185**
Water Quality (Waste Assimilation)	544,892	$22m - $40m	$41 - $73

Flood Mitigation	544,892	$52m - $74m	$95 - $135
Wildlife Habitat	544,892	$90m - $65m	$165 - $120
TOTAL	544,892	$227m - $280m	$417 - $513

Source: Economy League of Greater Philadelphia, Econsult Corporation, Keystone Conservation Trust, 2011. Return on Environment Partners and Econsult. 2019. Return on Environment: The Economic Value of Protected Open Space in Chester County, Pennsylvania.

* The per acre values from the 2011 study (2010 data) were adjusted for inflation by 15% to reflect 2018 values. No other increase in the value of the environmental benefits was assumed.

**The 2019 study estimated the benefits from water supply benefits from 38,430 acres of preserved farmland at $7.1 million a year or $185 per acre (p. 57). Benefits from water quality (waste assimilation) were estimated at $2.8 million a year or $73 an acre. (p. 58). Flood mitigation benefits were estimated at $5.2 million or $135 an acre (p. 58). Wildlife habitat provided an estimated $120 a year in benefits (p. 59).

Additional Environmental Benefits

Additional environmental benefits of preserved farmland include air pollution removal, carbon storage, and carbon sequestration.

Tree canopy cover has a higher rate of air pollution removal than open land. The 2011 study focused on tree canopy cover in estimating a per acre removal of ozone, PM-10 (particulates), Nitrogen dioxide (NO2), Sulfur dioxide (SO2), and Carbon monoxide (CO). The authors of the 2011 study noted that pollutant removal varies depending on the type of open space and amount of tree canopy cover and the density of the trees. In short, the more canopy cover, the more pollutants are removed (see Nowak et al., 2010). It is important to note that open farmland stores carbon, especially when crops are grown using no-till practices. This was not estimated by the 2011 study.

Air pollution removal value would be lower in rural areas where there is relatively less air pollution compared to urban and suburban areas. Carbon storage and carbon sequestration are higher in rural areas because of more forested land and the greater number of trees per acre.

The 2011 study estimated the tree canopy cover on preserved farmland at 5,931 acres, or 8.2 percent of the total tree canopy cover in the five-county region farmland (p. B 15). The study estimated the total value or air pollution removal of the tree canopy

cover in the region at $15 million (B. 18). Thus, the portion of air pollution removal accounted for by tree canopy on preserved farmland was estimated at $1.23 million per year or $207 per acre per year (see Table 6.3).

The 2011 study estimated the value of carbon sequestration at $1.94 million per year for all tree canopy on preserved land in the five-county region (2011, p. B.20). For tree canopy on preserved farmland, which is 8.2 percent of the total tree canopy, the value of carbon storage is estimated at $159,080 or $27 per acre per year. The value is based on a value of $21 ton for carbon, based on the i-Tree Vue model (USDA 2010).

For carbon storage, the 2011 study estimated the carbon storage benefits for the tree canopy cover in the five-county region at $61.38 million (2011, p. B. 20). For tree canopy on preserved farmland, which is 8.2 percent of the total tree canopy, the value of carbon storage was estimated at $5,033,160 or $849 per acre. Again, the value was based on a value of $21 ton for carbon, based on the i-Tree Vue model (USDA 2010).

Table 6.3 Value of the Tree Canopy on Preserved Farmland in the Five-County Region of Southeastern Pennsylvania, 2011.

Activity	Acres of Tree Canopy Cover on Preserved Farmland	Value per Year ($ millions)	Per Acre Value
Air pollution removal	5,931	$1.23m	$207
Carbon Sequestration	5,931	$0.159m	$27
Carbon Storage	5,931	$5.033m	$849
.			
TOTAL		$6.422m	$1,083

Source: Economy League of Greater Philadelphia, Econsult Corporation, Keystone Conservation Trust, 2011.

The 2011 study estimated the total air pollution removal, carbon sequestration, and carbon storage benefits from tree canopy cover on preserved farmland at $6,422,000 or $1,083 per acre (see Table 6.3). These estimates can be updated for inflation to 2018 and applied on a state-wide and county basis. Tree canopy cover is likely to be higher on preserved farmland in rural areas as opposed to metropolitan areas. For example, the 2019 estimated a tree canopy cover on preserved farmland in Chester County, Pennsylvania at 6,606 acres or about 1/6 of the total preserved farmland of 38,430 (p. 61).

The value of carbon storage and sequestration in the 2011 study was estimated at $21 a ton, whereas in the 2019 study, it was estimated at $71 a ton (2019, p. 61). This increase in value reflects in part the increase in carbon in the atmosphere, which has exceeded 400 parts per million and efforts to put a price on carbon, such as the California carbon cap-and-trade program. The value of carbon storage and sequestration is likely to be higher on rural preserved farmland, which tends to have more canopy cover compared to preserved farmland in metropolitan areas.

Table 6.4 Estimated Statewide Environmental Benefits of Farmland Preservation Program 2017/8 for Air Pollution Removal, Carbon Sequestration and Carbon Storage, Based on the 2011 and 2019 Studies.

Activity	Acres of Tree Canopy Cover on Preserved Farmland	Value per Year ($ millions)	Per Acre Value*
Air pollution removal	544,892	$130m - $156m	$238 - $286**
Carbon Sequestration	544,892	$17m - $53m	$31 - $97
Carbon Storage	544,892	$532m - $1,385m	$976 – $2,543
TOTAL	544,892	$679m -$1,594m	$1,245 - $3,309

Source: Economy League of Greater Philadelphia, Econsult Corporation, Keystone Conservation Trust, 2011. Return on Environment Partners and Econsult. 2019. Return on Environment: The Economic Value of Protected Open Space in Chester County, Pennsylvania.

* The per acre values from the 2011 study were adjusted for inflation by 15% to reflect 2018 values. No other increase in the value of the environmental benefits was assumed.

**The 2019 study estimated the benefits of air pollution removal from 6,606 acres of preserved farmland at $1.89 million a year or $286 per acre (p. 60). Benefits from carbon sequestration were estimated at $644,000 or $97 an acre (p. 61). Carbon storage benefits were estimated at $16.8 million or $2,543 an acre (p. 61).

Table 6.4 presents a range of the estimated annual economic benefits of air pollution removal, carbon sequestration and carbon storage on preserved farmland. The lower range of the ai pollution benefits more likely reflects the benefits of air pollution removal in rural places and the higher range suggests the benefits of air pollution removal in a metropolitan region. Conversely, the benefits of carbon sequestration and

carbon storage are likely to be higher in rural areas where there is more tree canopy cover and forests also tend to have more trees per acre.

Total Statewide Environmental Benefits from Preserved Farmland

The total statewide environmental benefits from preserved farmland can be estimated by adding the estimated dollar values of the water supply, flood mitigation, and wildlife habitat to the estimate dollar values of the air pollution removal, carbon sequestration, and carbon storage.

The range of the statewide environmental benefits of preserved farmland were estimated at $906 million per year, or $1,623 per acre, based on the 2011 study; and $1,874 million per year or $3,822 per acre, based on the 2019 study. The main difference between the 2011 and 2019 studies is the higher estimated value of carbon sequestration and carbon storage.

The value of environmental benefits is likely to grow over time as the population of the Commonwealth increases.

A Note on the Benefits of Farmland Preservation for the Chesapeake Bay

Preserved farms in the Susquehanna River Basin provide environmental benefits for the Chesapeake Bay. According to the Chesapeake Bay Program, agriculture is the single largest source of nutrient and sediment pollution entering the Bay. In 2015, an estimated 42 percent of the nitrogen, 55 percent of the phosphorous and 60 percent of the sediment entering the Bay came from agriculture (https://www.chesapeakebay.net/issues/Agriculture). Moreover, the Susquehanna River delivers a large majority of the nitrogen loading that enters the Bay. Pennsylvania along with Maryland and Virginia are under an agreement with the US Environmental Protection Agency to reduce nitrogen, phosphorus, and sediment loadings into the Bay according to a “pollution diet.”

The Susquehanna River Basin is shown in Figure 6.1. In Pennsylvania, the Basin covers most or all of 26 counties and parts of 10 counties. There are 2,300 farms and 250,000 acres of preserved farmland in the 26 counties, not counting the preserved farms in counties that are only partially in the Chesapeake Bay watershed. So, the actual number of preserved farms and preserved acres is certainly higher.

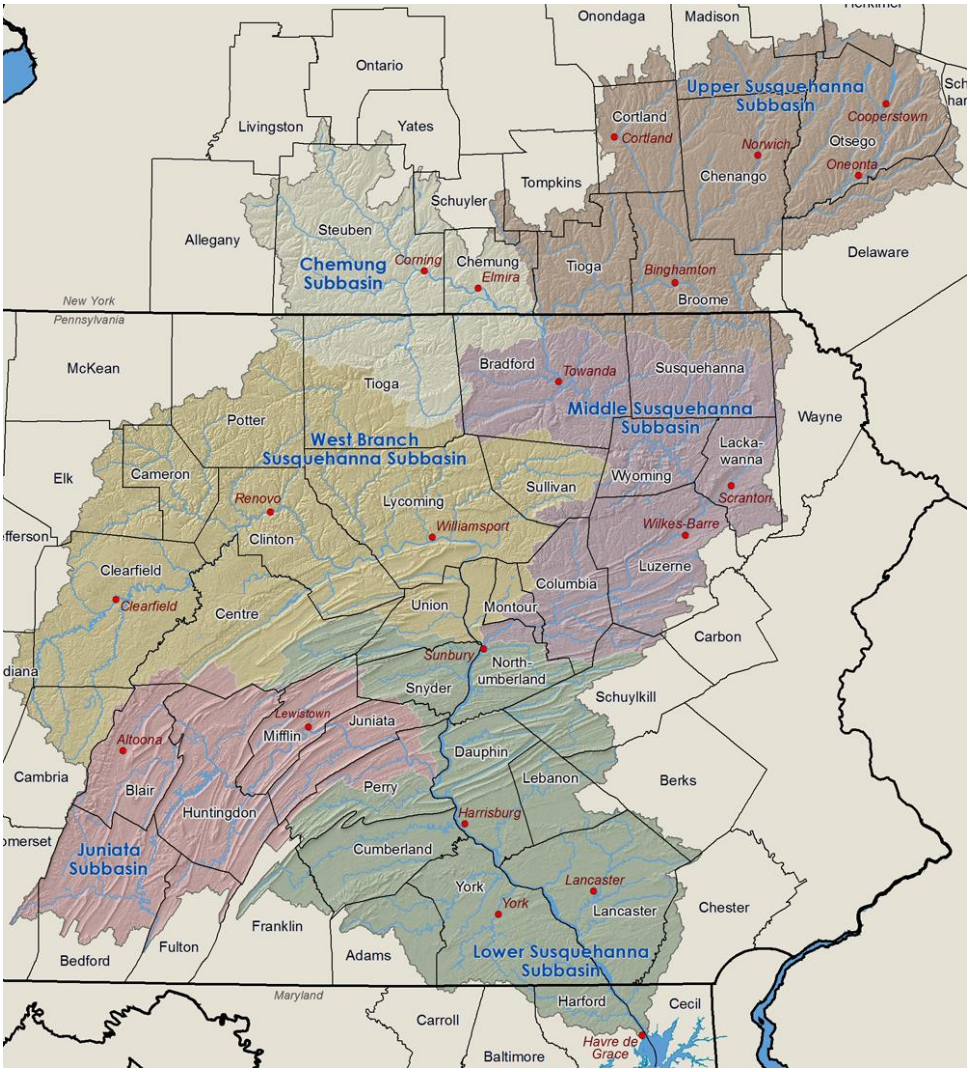

Figure 6.1. The Susquehanna River Basin.

Source: Susquehanna River Basin Commission. https://www.srbc.net/portals/susquehanna-atlas/data-and-maps/susquehanna-basin/.

Preserved farms must have a soil and water conservation plan at the time the conservation easement is finalized. Best management practices may include: grass waterways, manure management, strip cropping, streambank buffers, no-till, and contour farming, among others (see Table 6.5). Reducing soil erosion, managing manure, and intercepting runoff carrying fertilizers, manure, and soil particles are essential for reducing loadings of nitrogen, phosphorous, and sediment. In addition, the Chesapeake Bay Program works with farmers in the watershed to implement best management practices to help reduce nutrient runoff into Pennsylvania rivers and streams that empty into the Bay.

Table 6.5. Summary of Conservation Practices on 197 Farms with Conservation Easements, Preserved in 2017.

Practice	Number of Farms	Percentage of Farms
Conservation tillage	140	71
Contour farming	146	74
Crop rotations	124	63
Crop residue use	55	28
Cover crops	150	76
Diversions	28	14
Streambank protection	18	9
Strip-cropping	156	79
Subsurface drainage	7	4
Terraces	17	9
Water control structures	9	4
Waterways	81	41
Animal waste storage	102	51
Nutrient management system	103	52
Pasture and hay land management	134	68

Source: Pennsylvania Bureau of Farmland Preservation Annual Report, 2017, p. 12-13.

In sum, farmland preservation will continue to help Pennsylvania make progress toward meeting its 2025 pollution diet for nitrogen, phosphorus, and sediment loadings in the Chesapeake Bay Basin.

Chapter 7: Conclusions and Recommendations

Agriculture is a key sector of Pennsylvania's overall economy and is an important part of the economy of several Pennsylvania counties. The state/county farmland preservation program plays an important role in helping to maintain land in agricultural use. The popularity of the program is clear: more than 544,00 acres of preserved farmland and a nation-leading more than 5,200 preserved farms. The voluntary aspect of the program is one of its strengths: landowners recognize the value of the program and voluntarily choose to participate by selling a permanent conservation easement on their farms.

The purpose of this study was to:

A) Estimate how much overall economic activity is resulting from the acquisition of conservation easements;

B) Estimate the "multiplier effect" of farmland preservation payments; that is, how much additional economic activity occurs because of the public investment in preserving agricultural land;

C) Determine whether there is here a relationship between the amount of farmland preserved and the economic performance of the Commonwealth's and a county's agricultural industry;

D) Determine whether there a relationship between the amount of farmland preserved and local property taxes; and

E) Estimate the environmental benefits of preserved farmland in dollar terms.

A. Total Economic Impact: Conservation Easement Spending, Direct and Indirect Expenditures, Environmental Benefits

The impact of the conservation easement spending to preserve farmland, the direct and indirect expenditures associated with preserved farms, and the environmental benefits of preserved farms can be estimated on an annual basis, and could be estimated over time as well, if sufficient data were available.

Conservation easement spending in 2017 was $53.9 million (PA Bureau of Farmland Preservation, 2018, p. 3). Direct expenditures (farm output on preserved farms) on all farms preserved since 1989 was estimated at $584 million, Indirect expenditures related to preserved farms were estimated at $419 million. The value of environmental benefits on preserved farms was estimated at $906 million to $1,874 million. The total annual impact of the state/county farmland preservation program is estimated to be in a range from $1,962,900,000 to $2,877,000,000. Given the 544,892 acres preserved, the estimated economic impact of preserved farmland ranges from $3,600 per acre to $5,280.

For 2017, the average price per acre of a conservation easement was $3,269 (Pennsylvania Bureau of Farmland Preservation, 2018, p. 33).

Since the first farm was preserved through the state/county program in 1989, almost $1.6 billion has been spent to preserve 544,892 acres or an average cost of $2,936 per acre, not adjusted for inflation. Annual direct and indirect expenditures are not readily available, but it is important to note that the impact of the farmland preservation program has increased over time because the direct and indirect expenditures associated with preserved farms has grown along with the number of acres preserved.

This is not to say that all preserved farms would not be in operation today if the owners had not sold a conservation easement to preserve the farm. But the number of preserved farms (more than 5,200) and the number of preserved acres (more than 544,000) is impressive.

B. Farmland Preservation, the Multiplier Effect, and Economic Activity.

Pennsylvania's farmland preservation program has had a positive economic effect on the state's agricultural industry. The $1.55 billion investment in conservation easements, adjusted for inflation is worth about $1.75 billion in 2017 dollars. Two multipliers were estimated in this study: 1) a multiplier number; and 2) the direct, indirect, and induced effects from the conservation easement payments.

Using the multiplier number, conservation easement payments have generated economic activity estimated in a range from $2.835 billion million to $3.5 billion. This reflects an estimated multiplier of between 1.62 and 2, based on a traditional agricultural multiplier of about 2.64, minus leakages from the conservation easement payments for taxes, debt reduction, and other purposes not related to a farm operation. The 1.62 multiplier is based on the multiplier for agriculture reported by Team PA in their 2018 study.

This range of added economic activity does not include environmental benefits from improved soil and water conservation practices. An important feature of the Pennsylvania farmland preservation program is that it requires a preserved farm to have a soil and water conservation plan.

Second, in 2017, conservation easements were purchased on 197 farms for a total of $59.3 million. Using an estimate of the multiplier effect at $2 for each dollar spent on conservation easements, or a total of $119 million.

For 2017, the direct expenditures on all preserved farms in the form of farm product sales, wages, and landowner earnings were estimated at $582 million, using the methodology of two reports produced in 2011 and 2019;

The indirect and induced employment and spending that resulted from the direct spending and employment was estimated at $419 million.

The total estimated value of environmental benefits on preserved farms ranged from $906 million to $1.874 million.

The total economic impact of the state/county farmland preservation program in 2017 including the acquisition of conservation easements and the operation of all preserved farms was estimated at slightly more than $2 billion.

The first method of estimating a multiplier number appears to be more accurate. The second number depended on a five-county area around greater Philadelphia, where in 2011 only Chester County had preserved a significant amount of farmland and the county and a much larger agricultural economy than the others. Also, the 2019 study focused solely on Chester County and was used in the current study to update the environmental value of preserved farmland.

Finally, a noteworthy strength of the Pennsylvania farmland preservation program is its ability to leverage funds from:

1. Individual counties through the matching fund feature. Fifty-eight counties have created farmland preservation programs;

2. The federal Agricultural Conservation Easement Program, funded through the 2014 and 2018 Farm Bills;

3. Local townships; and

4. Private land trusts.

This leveraging in effect multiplies the impact of state dollars spent on farmland preservation.

C. The Amount of Farmland Preserved and the Economic Performance of the Commonwealth's and a County's Agricultural Industry. There appears to be a positive relationship between the amount of preserved farmland and the economic performance of the agricultural industry in the Commonwealth and in individual counties. In 1992, there were about 50,000 acres of preserved farmland in the Commonwealth and the state's agricultural output was worth $$3.57 billion. By 2017, a total of 543,000 acres had been preserved and the inflation-adjusted value of the state's agricultural output in 1992 dollars was $$5.173 billion. In 1992, the five leading counties in farmland acres preserved accounted for 40.5 percent of the value of the state's total farm output and in 2017, these counties accounted for 41.8 percent of the value of state's farm output. The top ten counties in farmland preservation had 53.6 percent of the value of the state's farm output in 1992 and 57.5 percent in 2017. Also, the ten counties had a greater percentage increase in the value of their farm output than the

entire state between 1992 and 2017. Six of the top ten counties in acres preserved were also among the top ten counties in the value of agricultural production in 2017.

The relationship between acres preserved and value of agricultural output in part reflects the fact that the top three counties in agricultural production (Lancaster, Berks, and Chester) have also created robust, well-funded county farmland preservation programs.

D. Farmland Preservation and Property Taxes. A study of farmland preservation and tax rates in townships in Lancaster County found some evidence that townships with more preserved farmland had lower municipal property tax rates than townships with relatively little preserved farmland. But this trend was not uniform across all townships. Individual counties may want to examine whether there is a relationship between the amount of preserved farmland and municipal property tax rates among the townships in their county.

E. The Environmental Benefits of Preserved Farmland. This study employed two methods to estimate the net present dollar value of environmental benefits associated with preserved farmland. The first net present value method was based on a 2011 study of preserved land in the five-county greater Philadelphia region. The second net present value method came from a 2019 report on the economic benefits of preserved land in Chester County, Pennsylvania. In both studies, the contribution of preserved farmland was estimated. This current study then extrapolated that findings of the 2011 and 2019 studies to a statewide level.

Based on the 2011 study, the current study estimated that preserved farmland provided $906 million in annual environmental benefits from water supply, water, quality, flood mitigation, air pollution removal, carbon sequestration and carbon storage. Based on the 2019 study, this study estimated the annual environmental benefits of preserved farmland at $1.874 billion a year. The main difference in the value between the two methods was that the 2011 study used a figure of $21 a ton for carbon sequestration and storage, whereas the 2019 study used $71 a ton in recognition of the greater value of carbon storage as the concentration of carbon in the atmosphere has increased.

The environmental value of preserved farmland is likely to grow as the population of Pennsylvania increases and more farmland is preserved.

Recommendations

This study suggests a number of recommendations for policy makers to consider in order to increase the economic impact of the state/county farmland preservation program. Over the years, the Bureau of Farmland Preservation has added several innovations to make the program more responsive to the needs of landowners. These innovations include:

1) The use of an easement payment in a like-kind exchange to acquire real estate in a tax-differed transaction. As a result, the easement payment is often invested in additional farmland and there is no immediate leakage to the multiplier effect through a capital gains tax liability;

2) The creation of the Installment Purchase Agreement option to spread out easement payments with tax-free interest over up to 20 years, much like a tax-free municipal bond, with the principal of the easement payment made at the end of the term. This payment method delays the capital gains tax liability well into the future;

3) A reimbursement program for expenses incurred by land trusts in preserving farmland; and

4) the creation of the Preserved Farms Resource Center help with business transition and succession planning for preserved farms. The Resource Center offers grants up to $3,000 per farm family for costs associated with transition planning (PA Bureau of Farmland Preservation, 2017, p. 6).

The following recommendations are meant to improve the effectiveness of the state/county farmland preservation program in stimulating economic activity.

How to achieve more economic impact with farmland preservation? The Pennsylvania farmland preservation program initially had no limit on the payment amount for a conservation easement. Then, the State Farmland Preservation Board adopted a cap of $10,000 an acre. The cap was then rescinded by the legislature. Few counties have made purchases of easements greater than $10,000 an acre. A return to a $10,000 an acre cap seems prudent. This will discourage farmland preservation in areas with heavy suburban and urban development pressure and tend to allocate preservation funds in areas with greater long-term potential for farming.

The requirement in the ranking system of each county that soils must count for at least 40 percent of the rating of a farm parcel should be reduced to 25 percent. Greater emphasis in the ranking systems should be placed on preserving farms with more than $100,000 a year in gross sales (see Table 1) and farms that are contiguous to or within a quarter mile of a preserved farm. At least 20 percent of the ranking points should be on the value of farm output, and another 20 percent on the proximity to other preserved farms. The focus of the program should be on preserving commercial farming operations that contribute significantly to the local agricultural economy. Also, preserving farmland in large contiguous blocks is a key strategy of a farmland preservation program (Daniels and Payne-Riley, 2017). Large contiguous blocks enhance the local business climate for agriculture and minimize the potential for conflicts with non-farm neighbors.

It is important to examine the size of preserved farms in terms of annual farm sales and acres. The state program has set a general limit of 50 acres as the smallest size farm that is eligible for preservation. Individual counties may set lower limits. The

concern here is that so-called “hobby farms” should not be eligible for farmland preservation funds. These farms generally produce less than $10,000 a year and add little value to agricultural economy (see Daniels, 1987). Farms larger than 50 acres accounted for a large majority of the land in farms in Pennsylvania both in 1992 and 2017 (see Appendix).

The sales class of preserved farms is also important. Farms with sales of more than $100,000 a year dominated the state’s agricultural economy in both 1992 and 2017. The state had initially set a general guideline of $25,000 a year in gross sales. A hobby farm generally has less than $10,000 a year in gross sales (Daniels, 1987). Moreover, many hobby farms and other farms do not show a net positive cash income (see Appendix).

Preserving hobby farms thus can be expected to have a low multiplier effect. The state and counties should be targeting farms with more than $100,000 a year in gross sales where additional capital will more likely be re-invested in the farming operation rather than supporting a rural lifestyle.

Farmland preservation funding levels and sources. One of the recommendations of the Team PA report is to “maintain the strength of Pennsylvania’s nation-leading Farmland Preservation Program” (Team PA, 2018, p. 14).

Ample sources of funding for farmland preservation exist in Pennsylvania. These include: the state’s dedicated two-cent a pack tax on cigarettes; clean and green re-payments; the federal Agricultural Conservation Easement Program (ACEP), counties, townships, and private land trusts. Funding levels from all sources have averaged about $50 million a year. This level, however, has varied over time. On the positive side, the two-cent a pack tax on cigarettes has produced steady revenues of more than $20 million a year. In addition, the state legislature provided a one-time increase in funding for farmland preservation through a line item in the state budget in the early 2000s. Counties have a strong incentive to match state funds; even so, county funding levels generally rise and fall with the national economy (see Figure 2.2).

In 2017, for example, the state authorized $25.5 million in cigarette tax funds and $9.5 million from the Environmental Stewardship Fund (Pennsylvania Bureau of Farmland Preservation, 2018, p. 4). The counties provided $16.7 million in matching funds, and federal ACEP program contributed $1.2 million. A total of $53,930,517 was invested in farmland preservation.

The demand for the farmland preservation program remains strong. Several counties report a backlog of applicants. The demand for farmland preservation funds exceeds the amount available each year. This suggests that farmland owners continue to see value in the sale of a perpetual conservation easement.

Perhaps the easiest way to increase funding for farmland preservation in Pennsylvania is for counties and land trusts to pursue ACEP funds. With the passage of

the 2018 Farm Bill, the ACEP program can be expected to provide somewhere between $100 million and $150 million a year in grants to state and local governments and land trusts to purchase conservation easements to farmland. In addition, counties should be encouraged to create a dedication funding source for farmland preservation, similar to the state's two-cent a pack tax on cigarettes. It is important to note that even a dedicated funding source may not always be reliable. With Pennsylvania's state budget deficit problems, some legislators have proposed taking the revenue from the cigarette tax to help fix budget shortfalls. These proposals have been defeated amid public outcry and expressed support for the farmland preservation program.

If the backlog of applicants to sell a conservation easement exceeds 1,000, as it did in the late 1990s, the legislature may again want to consider a line item in the state budget to increase funding for farmland preservation.

Some townships have increased the local income tax to raise money for land preservation. But these tend to be wealthier communities. Partnerships between county programs and private land trusts is another way to increase funding for specific farmland preservation projects. For example, the Lancaster County Agricultural Preserve Board and the Lancaster Farmland Trust have had a cooperative agreement since 1989 to share information and work on joint preservation projects when opportunities arise.

Recognize and Publicize the Environmental Benefits of Farmland Preservation. Agriculture has something of an image problem because of its contribution to water quality impairment. Pennsylvania's farmland preservation program requires that a soil and water conservation plan be on the farm at the time the conservation easement is finalized. Moreover, preserved farms are monitored annually or every two years to ensure that farmers are following the terms of the conservation easement and conservation plan.

Studies have shown that preserved farms provide a variety of environmental benefits, including: the water supply, flood mitigation, and wildlife habitat to the estimate dollar values of the air pollution removal, carbon sequestration, and carbon storage. In addition, more than 250,000 acres of farmland have been preserved in Pennsylvania's Susquehanna River Basin which drains into the Chesapeake Bay. Preserved farmland in Pennsylvania is helping the state to move toward its "pollution diet" levels for nitrogen, phosphorus, and sediment loadings in the Chesapeake Bay.

In sum, the environmental benefits of preserved farmland have real economic value and this value should be recognized and publicized. Farmers are supplying these environmental benefits through their stewardship of the land.

Note the Branding Opportunities of Crops and Livestock Produced on Preserved Farms. The Team 2018 report on Pennsylvania Agriculture stated that the "report is part of a larger process by the PDA, Team PA, and the Pennsylvania Agricultural Advisory Board to develop a proactive, shared vision and strategic plan for

Pennsylvania's agricultural sector" (Team Pennsylvania, 2018, p. 19). Farmland preservation is part of that shared vision and strategic plan, and not just for making farmland available for future generations.

Consumers increasingly want to know who is producing their food and how. Branding crops and livestock and the resulting food products as coming from a preserved farm could be a way to ask for higher prices on food products and hence increase returns to farmers and food processors.

Revisit the Economic Impact of the Farmland Preservation Program Every 10 Years. Rather than wait 30 years for the next report on the economic impact of the state/county farmland preservation program, it would be wise to conduct such a study at least every 10 years. Such studies should occur shortly after the release of the latest USDA Census of Agriculture, which provides a wealth of information at the state and county level on land in farms, the value of agricultural output, farms by acreage and value of agricultural output. The annual reports of the Bureau of Farmland Preservation also provide valuable information on the performance of the state/county preservation program. In addition, new studies of the value of preserved farmland, property tax rates and levels and amount of preserved farmland, and agricultural multipliers can also be analyzed and related to the farmland preservation effort in Pennsylvania.

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APPENDIX ONE: Pennsylvania Farmland Preservation Funding, 1989-2017 in Nominal, 1989 Dollars, and 2017 Dollars (in Millions of Dollars).

Year	GDP Price Deflator	Nominal Dollars	1989 Dollars	2017 Dollars
Dec 31, 2017	108.82	$54.6m	$31.15m	$54.6m
Dec 31, 2016	106.72	$51.7m	$30.08m	$52.68m
Dec 31, 2015	105.15	$48.1m	$28.39m	$49.74m
Dec 31, 2014	104.23	$49.94m	$29.74m	$52.04m
Dec 31, 2013	102.52	$51.6m	$31.27m	$54.59m
Dec 31, 2012	100.74	$42.4m	$26.12m	$45.54m
Dec 31, 2011	98.70	$40.4m	$25.41m	$44.16m
Dec 31, 2010	96.76	$41.8m	$26.83m	$46.44m
Dec 31, 2009	95.26	$55.8m	$36.38m	$62.78m
Dec 31, 2008	94.99	$78.57m	$51.35m	$88.55m
Dec 31, 2007	93.14	$81m	$54m	$92.66m
Dec 31, 2006	90.82	$149.7m	$102.32m	$174.4m
Dec 31, 2005	88.49	$66.1m	$46.39m	$78.46m
Dec 31, 2004	85.71	$73.6m	$53.33m	$89.2m
Dec 31, 2003	83.20	$68.33m	$50.99m	$84.39m
Dec 31, 2002	81.65	$67.74m	$51.51m	$84.68m
Dec 31, 2001	80.27	$71.45m	$55.26m	$90.17m
Dec 31, 2000	78.72	$70.48m	$55.58m	$90m
Dec 31, 1999	76.87	$87.91m	$71.01m	$113.76m
Dec 31, 1998	75.64	$38.2m	$31.36m	$49.85m
Dec 31, 1997	74.82	$42.68m	$35.41m	$56m
Dec 31, 1996	73.67	$38.3m	$32.27m	$50.67m
Dec 31, 1995	72.39	$26.8m	$22.98m	$35.78m
Dec 31, 1994	70.96	$25.5m	$22.31m	$34.3m

Dec 31, 1993	69.50	$24.08m	$21.5m	$32.77m
Dec 31, 1992	67.93	$18.82m	$17.2m	$25.9m
Dec 31, 1991	66.49	$24.97m	$23.32m	$34.68m
Dec 31, 1990	64.48	$22.45m	$21.62m	$31.59m
Dec 31, 1989	62.08	$28.42m	$28.42m	$40.64m
TOTAL		$1,541.44m	$1,113.5m	$1,751.02m

Source U.S. Bureau of Economic Analysis, PA Bureau of Farmland Preservation