Farmers' Participation in Agritourism: Does It Affect the Bottom Line?

Hyunjeong Joo, Aditya R. Khanal, and Ashok K. Mishra

Agritourism is an alternative source of farm income. We examine farmers' participation in agritourism activities to assess the impact of participation on farm household income and return to assets using a large farm-level survey. The results reveal that older, educated, and female operators are more likely to participate in agritourism. However, government subsidies and the population of the county are negatively correlated with agritourism. Of the types of farm operations examined, small-scale farms that involved agritourism generated the greatest household incomes and returns to assets. For operators of small farms, agritourism can boost the economic well-being of farm households.

Key Words: average treatment effect, farm household income, farm tourism, propensity score matching, recreational service, return to asset, small farms

Many types of tourism rely directly on ecosystem services and biodiversity (ecotourism, agritourism, wellness tourism, adventure tourism, etc.). The literature on tourism defines agritourism as the process of attracting people to the farm (Evans and Ilbery 1992) while the literature on sociology defines it as one type of entrepreneurial venture developed to enhance farm revenue or value (Che, Veeck, and Veeck 2005, Barbieri and Mshenga 2008). Thus, the tourism perspective regards agritourism as a unique entrepreneurial venture while the sociological perspective views it as a component of the entire farm structure.[1] Agritourism uses recreational and supply services provided by ecosystems, and the UC Small Farm Program (2012) defined it as "a commercial enterprise at a working farm, ranch, or agricultural plant for the enjoyment or education of visitors that generates supplemental income for the owner." In short, the lack of a consistent definition of agritourism and its characteristics has been a barrier to research enumerating its benefits (Busby and Rendle 2000, Phillip, Hunter, and Blackstock 2010).

For this study, we had to adopt a definition of agritourism that was consistent with the *Agricultural Resource Management Survey* (U.S. Department of

[1] See Busby and Rendle (2000) for the evolution of at least thirteen definitions of agritourism in the literature.

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Agriculture (USDA) 2006–2009) questionnaire used as the source of our data. Therefore, we used "the farmer received income from recreational and agritourism activities."[2] We believe that this definition of agritourism is closest to the general public perception of agritourism and can be measured to some extent (Che, Veeck, and Veeck 2005, Barbieri and Mshenga 2008). Motivations for undertaking agritourism include (i) increasing family discretionary income, (ii) evidence of growing interest by the public in supporting local farmers (Govindasamy, Italia, and Adelaja 2002), and (iii) economic pressures that induce farmers and ranchers to augment their incomes through diversification. While agritourism has a long history in Europe and Japan (Busby and Rendle 2000, Hill and Busby 2002, Sharpley and Vass 2006, Ohe 2002), it is a relatively recent addition to American farms and to rural development and policy discussions in the United States.

Recent data from the *Census of Agriculture* (National Agricultural Statistics Service (NASS) 2002, 2007) show the increasing popularity of agritourism in the United States. According to the 2002 and 2007 censuses, total revenue from agritourism jumped from $202 million in 2002 to $567 million in 2007 while the number of farmers engaged in agritourism decreased by 16 percent, from 28,016 to 23,350, during the same period. A closer examination of the census data offers further insights. Most of the decrease in the number of farmers consisted of farmers who earned $10,000 or less from agritourism. The number of farmers who received more than $10,000 from agritourism increased by 45 percent and those farmers accounted for 92.7 percent of the total revenue from agritourism in 2007. These figures shed light on some of the structural changes occurring in agritourism recently, but more in-depth research is warranted to delineate the causes of such changes.

According to a 2007 report published by USDA's Economic Research Service (Brown and Reeder 2007), agritourism, which includes hunting, fishing, horseback riding, and other on-farm activities, provided income to about 52,000 U.S. farmers (2.5 percent of the U.S. total) in 2004. Brown and Reeder (2007) stated that agritourism is relatively common in Europe and other parts of the world and could play a more important role in the U.S. economy as well, both as an alternative source of farm income and as a way for rural communities to diversify and stimulate their economies.

Agritourism is an attractive option for farm operators wishing to increase returns on farm assets (Bernardo, Valentin, and Leatherman 2004, UC Small Farm Program 2006). It also offers opportunities to supplement income from farming and diversify their income streams,[3] which typically are driven by a complex set of goals including ones that are intrinsic in nature[4] (McGehee and Kim 2004, Ollenburg and Buckley 2007), particularly for small-scale farms. Agritourism also can allow for more complete use of a farm household's assets and expand employment opportunities for household members. Finally, we

[2] Farmers were queried on income from agritourism activities that included (i) hunting, fishing, and horseback riding; (ii) hospitality services, overnight guests, and ranch stays; (iii) guided farm, ranch, and winery tours; (iv) entertainment services such as harvest festivals, on-farm rodeos, and petting zoos; and (v) other recreation or agritourism activities.

[3] Much of the literature on business diversification has focused on large businesses and generally overlooked small-business diversification (Reinsch and Lynn 1990).

[4] Examples of intrinsic goals include "doing the work you like" and "being able to arrange hours of work." In other words, independence. Others include preservation of a rural lifestyle and social interaction with guests.

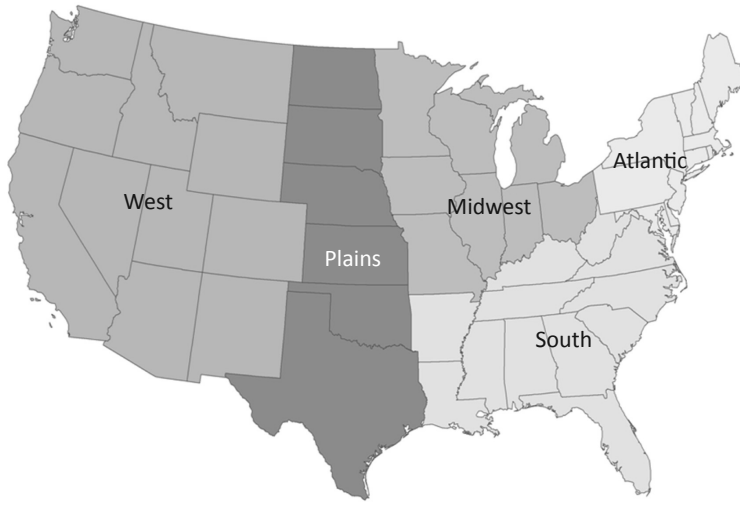

Figure 1. U.S. Geographic Regions

Source: Economic Research Service, USDA, www.ers.usda.gov/data-products/chart-gallery.

note that most of the research so far conducted on agritourism has relied on farmers' reports of their goals and motivations—whether those goals are being advanced has rarely been examined quantitatively. The research presented here contributes to filling that gap.

Therefore, our objective is to assess the impact of farmers' participation in agritourism on returns to assets (ROA), farms' total household income (THI), and net farm income per dollar of owned assets (NFIPOA). We study two types of farms, small (sales less than $250,000) and large (sales greater than $250,000). This study contributes to the literature in several ways. First, we use farm-level data in combination with other county-level data to study participation in agritourism. The analysis is unique in the large representative sample comprised of farms of different economic sizes and located in various regions of the United States (see Figure 1). Second, we further investigate the impact of participation in agritourism on the economic well-being of farm households (including total household income and return on assets) for small and large farms separately. Third, we use recent data (2007, 2008, and 2009). Finally, the study employs a propensity score matching (PSM) method to correct for self-selection bias in estimating the impact of agritourism on ROA, THI, and NFIPOA.

Motivation to Participate in and Advantages of Agritourism

Previous studies of agritourism in the United States have focused mainly on the operators' goals and motivation for starting agritourism enterprises (e.g., Nickerson, Black, and McCool 2001, McGehee and Kim 2004). Nickerson, Black, and McCool (2001) pointed out that agritourism is a popular way for farmers to diversify their operations and incomes. Using data from farms in Montana, the authors analyzed motives for diversification and abstracted eleven main reasons for undertaking agritourism: fluctuations in agricultural income, employment for family members, additional income, loss of government

agricultural programs, meeting a need in the recreation market, tax incentives, companionship with guests, interest/hobby, better use of farm resources, the success of other farm/ranch recreational businesses, and education of consumers. The authors also reported that farm owners were most concerned about fluctuations in agricultural income; diversification was used as a tool to stabilize their incomes. Farmers who rented their land were most concerned about tax incentives available for agritourism operations.

Several studies have stressed the importance of noneconomic motives for agritourism.[5] For example, Barbieri and Mahoney (2009) identified continuance of farming and ranching from one generation to another and enhancement of quality of life as important diversification goals among farmers in Texas. Other studies have determined that farmers' choosing to incorporate agritourism facilities and programs into their operations relates to a broad range of goals, including educating people about farming, meeting personal entrepreneurial goals,[6] and business succession (Tew and Barbieri 2012, McGehee and Kim 2004, Rob and Burton 2004, Getz and Carlsen 2000, Bowler et al. 1996).

Agritourism can play an important role in the business of small farms. For example, McGehee and Kim (2004) surveyed small-scale family farmers in Virginia and found that the number of acres owned, their economic dependence on farming, and the perceived popularity of agritourism were important motivating factors for their involvement in the industry. Bernardo, Valentin, and Leatherman (2004) and Carter (1998) both suggested that farm-specific characteristics, including the operators' farming experience, access to capital, and size of operation, were important factors in determining a farmer's participation in agritourism. Finally, Evans and Ilbery (1992) pointed out that small-scale farmers involved in agritourism activities reflected a "survival strategy," a point of much discussion in the literature on small farms. Furthermore, farmers who pursue survival strategies often are earning marginal returns economically and so tend to be more concerned about maintaining the viability of their businesses.

While the prior studies offer insights into agritourism, they suffer from being largely anecdotal and may have limited applicability because they examine small areas or regions. Moreover, none of the studies in the literature have examined the effect of participation in agritourism on farm incomes and returns to assets. Finally, as discussed by Mace (2005) and Nickerson, Black, and McCool (2001), no clear consensus has been reached on the factors that are important in determining a farmer's involvement in the agritourism business.

Barbieri and Mshenga (2008) studied the impact of owner characteristics on the gross income of agritourism farms. Data were collected in 2005 from 853 members of the North American Farmers' Direct Marketing Association (NAFDMA), which included operators of working farms that generated additional income through agritourism, nonfarmers, and about 449 operators of agritourism farms. An interval regression model was employed with annual gross income as the dependent variable. The results showed that length of time the operator was in business, number of employees, number of farm acres, and being male or white were positively correlated with gross income. Age, on

[5] Gasson (1973) argued that farmers may choose to maximize satisfaction within a given preference system rather than maximize income.

[6] Some goals associated with the entrepreneurial nature of diversification, such as providing a challenge, being one's own boss, and becoming financially independent, also have been identified (Getz and Carlsen 2000).

the other hand, was negatively correlated with gross income. The study used annual gross income from agritourism as a measure of performance but did not include income from other enterprises of the farm so did not evaluate total gross farm income.

Bernardo, Valentin, and Leatherman (2004) analyzed the status of the agritourism industry in Kansas and found that it made multifunctional contributions to long-term food security, viability of rural areas, cultural heritage, land conservation, maintenance of agricultural landscapes, and agri-biological diversity. The authors also found that the United States was far behind Europe and Asia in terms of development of an agritourism industry. For instance, approximately 30 percent of all farm businesses in the United Kingdom at the time were engaged in nontraditional agricultural activities such as outdoor recreation, educational experiences, direct agricultural sales, accommodations, and entertainment.

We now turn our attention to the issue of agritourism and farm performance. The relevance of economic goals behind farm diversification through agritourism, relating either to income enhancement or maximization of farm resources, has been consistently found in European and U.S. studies (Turner et al. 2006, McGehee and Kim 2004, Nickerson, Black, and McCool 2001). A recent study of agritourism among New Jersey farmers (Schilling, Sullivan, and Komar 2012) showed that some New Jersey farmers were driven to agritourism for financial reasons while others were not. Despite a growing body of research, the literature remains inconclusive regarding the potential benefits of agritourism to farm households. Some have argued that agritourism income is inconsequential (Busby and Rendle 2000, Fisher 2006, McGehee 2007, Nickerson, Black, and McCool 2001, Ollenburg and Buckley 2007, Sharpley and Vass 2006). In a recent study, Tew and Barbieri (2012) could not conclusively identify economic benefits from agritourism and found instead that agritourism participation was motivated primarily by other goals, such as marketing.[7]

The studies presented have investigated noneconomic motives for participating in agritourism, mostly through qualitative analyses. Additionally, the literature reviewed indicates that agritourism is an essential tool by which to enhance farm incomes and farm household incomes in general. However, studies to date have fallen short of identifying factors that determine whether farmers will choose to participate in agritourism and whether agritourism has an impact on farmers' net income per dollar of owned assets, household income (a measure of short-run financial success), and returns on assets (a measure of long-run financial success). We explore these questions.

Methods

Data

We use data from USDA's *Agricultural Resource Management Survey* (ARMS) for 2006, 2007, and 2008. The ARMS is conducted annually by the Economic Research Service and National Agricultural Statistics Service. The survey collects data to measure farmers' financial condition (farm income, expenses, assets, and debts), operating characteristics of farm businesses, costs

[7] Tew and Barbieri (2012) pointed out that agritourism provides a number of nonmonetary benefits that include personal entrepreneurial or lifestyle goals, expansion of farm employment opportunities for family members, and preservation of a rural lifestyle.

associated with producing agricultural commodities, and the financial well-being of farm operators' households. As a result, it also provides information about relationships between agricultural production, resources, and the environment. The target population of the survey is operators associated with farm businesses representing agricultural production in the contiguous United States. Each survey is completed by a single senior farm operator who is responsible for most of the day-to-day management decisions for the operation.

In this study, we use pooled data from 2006 through 2008. We exclude operator households that were organized as nonfamily corporations or cooperatives and farms that were run by hired managers from the sample. Data regarding income sources and wealth components (farm and nonfarm) were collected in detail. In this case, wealth is defined as the difference between total assets and total debts.[8] The survey collects data on (i) farm and nonfarm debt, classifying it as real-estate or non-real-estate, and (ii) farm household assets valued at market prices at the end of each year. We estimate nominal and real capital gains on farm assets and debt (see Mishra and El-Osta 2009). Since we are using pooled data for 2006 through 2008, we adjust the variables for total household income and net worth (wealth) for inflation using the consumer price index (*www.bls.gov/cpi*) measured in 2006 U.S. dollars.

The ARMS uses a multi-phase sampling design and allows each sampled farm to represent a number of similar farms in the population by way of a survey expansion factor that is defined, in turn, as the inverse of the probability of the surveyed farm being selected. Therefore, following Goodwin and Mishra (2004), we adopt a bootstrapping approach that consistently accounts for the stratification inherent in the survey design.[9] The ARMS database contains a population weighting factor for the number of farms in the surveyed population (i.e., all U.S. farms) represented by each individual observation. We use this factor in a probability-weighted bootstrapping procedure. Specifically, the data is sampled (N observations are selected from the sample data) with replacement, and the models are estimated using the pseudo-sample. This process is repeated several times, and estimates of the parameters and their variances are given by the sample means and variances of the replicated estimates. We use 2,000 replications.

In the first-stage probit model, the dependent binary variable, participation in agritourism, takes a value of one if the farm received income from agritourism and zero otherwise. In the second stage, the dependent variables are THI and ROA to allow us to assess the impact of agritourism.

We group the independent variables into four categories: operator characteristics, farm characteristics, county-level variables, and regional variables. The operator characteristics are primary occupation (equals one if farming and zero otherwise), age, educational attainment, and gender. The farm characteristics are total operated acres (in log), receipt of government payments (equals one if payments were received and zero otherwise), small farm size (equals one if gross farm income is $250,000 or less and zero otherwise), livestock as the primary enterprise (equals one if more than 50 percent of the farm's income comes from a livestock enterprise and zero otherwise), and high-value crops (fruits, nuts, nursery products, and vegetables) as the primary

[8] Wealth (net worth) is the sum of the net worth of farm assets (farm assets – farm debt) and the net worth of nonfarm assets (nonfarm assets – nonfarm debt).

[9] Goodwin, Mishra, and Ortalo-Magne (2003) pointed out that the jackknife procedure may suffer from some limitations and proposed the bootstrapping procedure as an alternative.

enterprise (equals one if more than 50 percent of the farm's income comes from high-value crops and zero otherwise). We also include variables at the county level that may have an impact on a farmer's decision about participating in agritourism: county median household income, an amenity index,[10] the number of farms that involve agritourism in the county in 2007, the population of the county, and an index of mean soil productivity.[11] The regional dummy variables indicate the location of each farm: Atlantic, Southern, Plains, Western, or Midwest region.

Table 1 presents descriptive statistics for the variables used in the empirical model and summary statistics for all conventional farms (those not participating in agritourism) and agritourism farms. The three-year ARMS data set netted approximately 19,300 farm households and just 3 percent (600) of those participated in agritourism. The data in Table 1 reveal that operators of farms that included agritourism were somewhat older (see Figure 2 for the frequency distribution) and more highly educated (see Figure 3 for the frequency distribution) than operators of conventional farms. About 9 percent of the agritourism farms were operated by women. Additionally, agritourism farms had higher amenity index values and about 60 percent of the farms had received some form of government payment compared to 53 percent of conventional farms. The Plains and Western regions had the largest percentage of agritourism participation. On the other hand, conventional farms (farms that did not participate in agritourism) exceeded agritourism farms in terms of production of high-value crops, median income, and productive land.

Conceptual Framework

Let us assume that two individuals, the farm operator and a spouse, work and live in the household. We also assume that the household derives utility from consumption and leisure, $U_i(Y_i, L_i)$. This framework is similar to ones proposed by Dawson (1984), Benjamin, Corsi, and Guyomard (1996), and Blanc, Cahuzac, and Elyakime (2008). The farm household maximizes utility subject to time and income constraints. A distinguishing feature of the proposed farm household is that it derives income from farming activities and off-farm work. A farm household's utility maximization can be represented as

$$\text{Max } U_i(Y_i, L_i), \quad Y_i = NFIi + FI_i \tag{1}$$

where L_i represents leisure time and Y_i represents total income of household i. The allocation of time devoted to income-producing and leisure activities can be represented as $L_i = T_i - (TF_i + TNF_i)$ where T_i is the farm household's total time, TF_i is time spent on farm activities, and TNF_i is time spent on nonfarm activities.

[10] Climate, topography, and water area (conserving or nonconserving) are strongly correlated with rural county population changes over the past 25 years. The natural amenities index captures much of this relationship and is described in a report from the Economic Research service (see *www.ers.usda.gov/publications/aer781* for details).

[11] Productivity refers to the suitability of the soil as a plant growth medium and the favorability of the climate. While productivity is complex, some useful proxies include crop yield or yield potential and one or more specific soil attributes such as the soils' water-holding capacity. The soil productivity index (Pierce et al. 1983) was created to combine multiple soil attributes into a single number (1–100) with 100 designating the most productive soil.

Table 1. Descriptive Statistics of Variables

	Total		No Participation in Agritourism		Participation in Agritourism	
Variable	**Obs.**	**Mean**	**Obs.**	**Mean**	**Obs.**	**Mean**
Agritourism participation	19,181	0.03	18,581	0.00	600	1.00
Income and Profit Measures						
Total household income	19,181	141,141	18,581	140,016	600	175,989
Return on assets	19,181	0.0508	18,581	0.0507	600	0.0539
Net farm income per owned assets	19,181	0.1368	18,581	0.1354	600	0.1802
Operator Characteristics						
Farmer's primary job (1 if farming)	19,181	0.70	18,581	0.70	600	0.80
Operator age (years)	19,181	56.44	18,581	56.38	600	58.45
Educational attainment (years)	19,181	13.40	18,581	13.37	600	14.19
Female (1 if female operator)	19,181	0.07	18,581	0.07	600	0.085
Farm Characteristics						
Total acres (log)	19,181	5.47	18,581	5.42	600	7.13
Government payment[a] (1 if farm received payment)	19,181	0.53	18,581	0.53	600	0.59
Small farms (1 if farm is small)	19,181	0.60	18,581	0.60	600	0.57
Livestock farm (1 if has livestock enterprise)	19,624	0.50	18,581	0.50	600	0.65
High-value-crop farm (1 if farm primarily produces high-value crops)	19,624	0.13	18,581	0.13	600	0.09
County Characteristics						
Median household income	19,493	44,761	18,542	44,735	600	44,439
Amenity (index)	19,435	3.58	18,566	3.57	600	3.84
No. of agritourism farms in 2007 in county (percent)	17,946	9.67	17,208	9.37	587	19.19
County population (log)	19,574	10.73	18,542	10.75	600	10.13
Mean soil productivity (index)[b]	19,145	71.07	18,336	71.18	585	68.95
Regional Location						
Atlantic (1 if farm is in region)	19,624	0.20	18,581	0.21	600	0.14
Southern (1 if farm is in region)	19,624	0.19	18,581	0.20	600	0.15
Plains (1 if farm is in region)	19,624	0.17	18,581	0.17	600	0.35
Western (1 if farm is in region)	19,624	0.19	18,581	0.19	600	0.27
Midwest (1 if farm is in region)	19,624	0.22	18,581	0.23	600	0.09

[a] Includes farms receiving any kind of government payment. These include commodity farm program payments (direct and indirect), conservation reserve payments, wetland reserve payments, and other state and federal program payments.

[b] A soil productivity index that ranged from 0 (least productive) to 100 (most productive) is used. See Pierce et al. (1983) for details.

The farm household's total income is derived from farm income (FI_i) and nonfarm income (NFI_i), and farm income includes the household's net income from agritourism. Specifically,

$$(2) \qquad FI_i = \mathbf{P}_i\mathbf{Q}_i - \mathbf{C}_i\mathbf{Q}_i + (Agritourism\ Revenue_i - Agritourism\ Cost_i)$$

where $\mathbf{P}_i$, $\mathbf{C}_i$, and $\mathbf{Q}_i$ are vectors of output prices, costs, and farm outputs associated with farm production for farm household i. Production is associated with various farm and farmer attributes (such as farm size, human capital, managerial ability, operator age, and educational attainment).

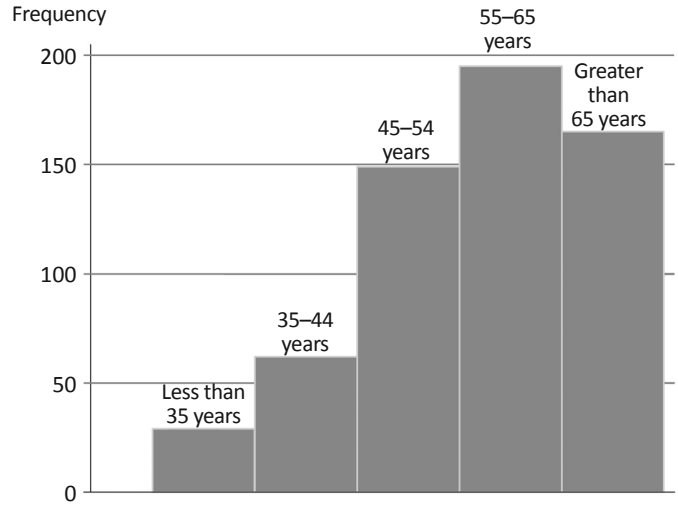

Figure 2. Distribution of Operators' Age for Those Participating in Agritourism

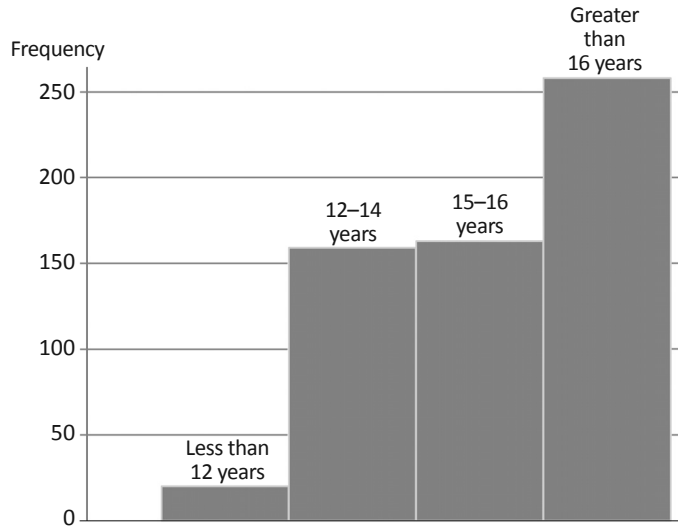

Figure 3. Distribution of Operators' Educational Attainment for Those Participating in Agritourism

It is obvious that participation in agritourism impacts the return to farming (net farm income). Net farm income is an important measure of the performance of the farm as a business. Taken by itself, however, it leaves some important questions unanswered. For example, it fails to effectively capture how efficiently farmers use their assets. Therefore, we use NFIPOA, the net farm income divided by the total value of the farmer's owned assets, as a measure of farming efficiency. Note that NFIPOA is not defined by a unit. A higher NFIPOA denotes greater efficiency and implies that each dollar in value of the owned assets produces more than a dollar in net farm income, a desirable outcome for farmers.

However, we are interested not only in the net return to farming but also in total household income, an indicator of economic well-being in the short run (Mishra et al. 2002). Equation 1 shows that both the return to farming (net farm income) and leisure time have an impact on the well-being of farm households (Mishra et al. 2002).

The impact of participation in agritourism on NFIPOA, ROA, and THI can be represented as

$$FP_i^J = a_0 + \sum a_{ij} M_{ij} + \beta A_i + \epsilon_{0i} \quad (J = ROA, THI, NFIPOA) \tag{3}$$

$$A_i = \theta \mathbf{Z}_i + \epsilon_{1i} \tag{4}$$

where FP_i^J is an indicator of the benefit (financial performance) of agritourism to farm household i and A_i is a dummy variable indicating participation in agritourism. Participation in agritourism is influenced by a set of factors, $\mathbf{Z}$, and unobservable factors captured by ϵ_1. $\mathbf{M}_{ij}$ represents a vector of managerial abilities that influence NFIPOA, ROA, and THI, which we use as indicators of financial performance. These income and profit measures are commonly used in the literature (Mishra et al. 2002, Mishra and El-Osta 2009).[12] THI is used because it measures the maximum amount that can be consumed by a household in a given period while holding real wealth steady (Eisner 1989).[13] This approach implies that current economic well-being rather than future well-being is of interest to financial economists, researchers, and policymakers. The household's members may scarcely be aware of many of the income components that contribute to future economic well-being (such as contributions to pension plans).

Recall that THI includes income from farming and from nonfarm activities. Farm operators, being self-employed, also are interested in measuring the economic performance of their farming businesses. The appropriate measure of the economic performance of farms has been a topic of much interest among economists and accountants. Several studies have investigated net farm income as a performance measure (Melichar 1979, Haden and Johnson 1989). However, net farm income does not address opportunity costs as a measure of financial performance or success. ROA provides a way to assess the overall efficiency with which farm assets are used to produce net income. It is probably the single best overall measure of operating performance because it allows for

[12] Mishra et al. (2002) demonstrated how income is earned and spent by a farm household.

[13] Income from production is generated both by the labor of individuals and by the capital that they own.

a comparison of farm incomes in spite of different sizes of farms (Gloy, Hyde, and LaDue 2002, Mishra and El-Osta 2009). We define ROA as

$$(5)\quad ROA = \frac{\begin{array}{c}(\text{net farm income} + \text{farm interest expense}) - \\ (\text{estimated value of unpaid operator labor management})\end{array}}{\text{total farm assets}}.$$

We replace the dependent variable in equation 3 with ROA as a measure of financial performance.

Empirical Approach

Estimation of a treatment effect under a nonexperimental setting is increasingly popular in social science research. A conventional method by which to estimate the treatment effect is to use treatment status as a regressor in a standard regression model. An alternative method that is gaining recognition in social science research is matching observations in the treatment group with observations in the control group based on some observable characteristics. A number of matching estimators have been proposed based on the algorithm to match observations for the two groups. Rubin (1983) proposed a propensity score in which one can estimate the predicted probability of being in the treatment using a logit or probit model.

Models of treatment effects using a propensity score also are gaining popularity in agricultural and farm household economics. Recently, Uematsu and Mishra (2012) used this method to study impacts of participation in organic farming. An important feature of the propensity score model is that it summarizes information contained in the multi-dimensional vector into a single index variable (Becker and Ichino 2002). For the matching analysis, we employ the following probit model.

$$(6)\quad I_i = \begin{Bmatrix} I_i^C & if & A_i = 0 \\ I_i^T & if & A_i = 1 \end{Bmatrix}$$

I_i is the income of farm i, I_i^C is the farm income of farmers who are not involved in agritourism, I_i^T is the farm income of farmers who are involved in agritourism, and A_i is a binary variable that takes a value of one for farmers participating in agritourism and zero otherwise.

The propensity score is a conditional probability of treatment under pretreatment variables (Rubin 1983, Becker and Ichino 2002). We can estimate a propensity score using a probit or logit model. In this case, A (the dummy variable for participation) becomes the dependent variable and $\mathbf{x}$ is a set of independent variables.

$$(7)\quad p(\mathbf{x}) = Pr(A = 1|\mathbf{x}) = E(A|\mathbf{x})$$

To find the control observation, we need the matching estimation. We use the nearest-neighbor matching estimator proposed by Abadie et al. (2004) using the "nnmatch" command in Stata. The nearest-neighbor matching estimator also employs a matching scale that summarizes information from multiple variables into a single index using the vector norm $||\ \mathbf{x}\ ||\ v = (x'\mathbf{V}x)^{1/2}$ where $\mathbf{V}$ is the positive definite variance matrix used to weight variables through

normalization by standard deviation. The distance between two observations is defined by $||\mathbf{z} - \mathbf{x}||_v$ where $\mathbf{z}$ and $\mathbf{x}$ are vectors of observable characteristics for the two observations. The "nearest neighbors" are identified after applying the weighting index to all observations. For an application of the nearest-neighbor matching estimator using Stata, see Abadie et al. (2004). We need to stratify the conditional independence, unconfoundness, and balancing condition assumptions to evaluate the propensity score and matching method. For a discussion of these assumptions, see Rubin (1983), Heckman, Ichimura, and Todd (1998), and Imbens (2004).

Finally, using the propensity score, we can estimate the "average treatment effect on the treated" (ATT) as one of the measures of the treatment effects. The empirical estimator of ATT is defined as

$$ATT = \frac{1}{N_1}\sum_{i \in A=1}^{N_1}[I_i - I_{0i}] \tag{8}$$

where N_1 is total observations in the treatment, i denotes the individual observation, I_i is the observed outcome, and I_{0i} is the unobserved outcome:

$$I_{0i} = \begin{cases} I_i & \text{if } A_i = 0 \\ \frac{1}{M}\sum_{m \in M_i} I_m & \text{if } A_i = 1 \end{cases} \tag{9}$$

where M is the matched observation, M_i is observations in the control group that match observation i, and I_{0i} if $A_i = 1$ is a weighted average of the outcome variables for all of the matched observations in the control group (Uematsu and Mishra 2012).

Empirical Results

Probit Analysis

We present the results of our estimations in the probit model in Table 2 (all farms), Table 3 (small farms), and Table 4 (large farms). The dependent variable is a dummy variable that indicates whether a farm household participated in agritourism. The probit model also enables us to estimate the propensity score based on the observables. We satisfied the balancing property using the algorithm detailed in Becker and Ichino (2002). The likelihood ratio statistics of 859.32 for all farms, 505.08 for small farms, and 359.47 for large farms suggest that the estimated model is statistically significant at the 1 percent level.

In terms of all farms covered by the survey, farm operators who indicated that farming was their primary occupation were more likely to participate in agritourism than those with nonfarm occupations. Since most of the activity of agritourism is related to farms and pastures, this result makes sense. Operators who were older, more educated, and female were more likely to be participating in agritourism. Farms, regardless of size based on gross cash income, that were located in the Atlantic and Southern regions of the United States were most likely to include agritourism while farms located in the Midwest were least likely to be participating in agritourism. Midwest farms were most likely to grow cash grains and to receive government subsidies in case of income shortfalls. Lastly, farms specializing in livestock and high-value crops were more likely to be

participating in agritourism. These findings are consistent with Mace (2005), Brown and Reeder (2007), and Frost and Wacher (2010).

Government payments (subsidies) play an important role in production agriculture and the survival of farms. The results reported in Table 2 for all farms indicate that farmers who received government subsidies were less likely than other farmers to be participating in agritourism. This was also true for small farms (see Table 3). It is plausible that government payments provide a disincentive to diversify risk via participation in agritourism, especially for small-scale farmers who are more likely to receive conservation payments and more off-farm income (Mishra et al. 2002). Goodwin and Schroeder (1994) noted that government programs are intended to decrease exposure to risk and that farmers who participate in such programs are less likely to be involved with production contracts, commodity futures, and the options market. In addition, Robison and Barry (1987) pointed out that government programs typically provide risk-reduction opportunities, thereby reducing the need for additional sources of income as a buffer against income shocks.

Several county (location) characteristics have an impact on farmers' decisions about agritourism. For example, higher median household income in a county and the number of agritourism farms operating in the county have a positive and significant correlation. It is reasonable to think that people in a county

Table 2. Probit Model Parameters for All Farms – *Dependent Variable*: Participation in Agritourism

Variable	Coefficient	Standard Error	p-Value
Primary job: farming	0.114	0.055	0.039
Operator age	0.004	0.002	0.023
Educational attainment of operator	0.082	0.011	0.000
Female	0.256	0.077	0.001
Total acres (log)	0.232	0.015	0.000
Government payment	–0.131	0.051	0.010
Small farms (gross sales less than $250,000)	0.251	0.051	0.000
Livestock farm	0.245	0.049	0.000
High-value-crop farm	0.201	0.083	0.015
Median household income in the county	0.000	0.000	0.000
Amenity (index)	0.018	0.029	0.531
Number of agritourism farms in 2007 in the county	0.016	0.001	0.000
County population (log)	–0.098	0.019	0.000
Mean soil productivity (index)	–0.002	0.002	0.243
Atlantic region	0.159	0.077	0.039
Southern region	0.187	0.086	0.029
Plains region	0.100	0.079	0.205
Midwest region	0.089	0.093	0.336
Sample	17,586		
Log-likelihood	–2,092.45 (859.32***)		
Likelihood ratio test	p-value (LR = 0) < 0.000		

Note: *** denotes statistically significant at the 1 percent level.

with a relatively high median income are more willing to pay for agritourism, perhaps from a recreational point of view. These findings are consistent with Bernardo, Valentin, and Leatherman (2004) and McGehee and Kim (2004). It seems that farmers get involved in agritourism by learning from other farmers in the county. Specifically, Table 2 (all farms) indicates that the correlation between the number of agritourism farms in the county and participation in agritourism is positive and statistically significant. This finding points to farmers adopting successful strategies used by other farms in the county. Farmers in more heavily populated counties are less likely to participate in agritourism than farmers in more rural counties. A possible explanation is that owners of farms located in or near highly populated counties may be more likely to sell their farms to developers for housing and/or commercial projects (shopping complexes, parks, and recreation facilities), a much more lucrative proposition than agritourism.

We next evaluate whether any of these factors affect participation in agritourism differently when we focus on small (less than $250,000 in gross sales) and large farms (more than $250,000 in sales). In the case of small farms, most of the factors that affect participation in agritourism are similar to those in the all-farms case (Table 2) except for operator age, high-value crops, and mean spoil productivity. Both the operator age and high-value crop

Table 3. Probit Model Parameters for Small Farms – *Dependent Variable*: Participation in Agritourism

Variable	Coefficient	Standard Error	p-Value
Primary job: farming	0.229	0.061	0.000
Operator age	0.002	0.002	0.570
Educational attainment of operator	0.082	0.015	0.000
Female	0.279	0.083	0.001
Total acres (log)	0.208	0.020	0.000
Government payment	–0.160	0.064	0.012
Livestock farm	0.111	0.064	0.081
High-value-crop farm	0.082	0.117	0.485
Median household income in the county	0.000	0.000	0.008
Amenity (index)	0.006	0.039	0.886
Number of agritourism farms in 2007 in the county	0.015	0.002	0.000
County population (log)	–0.088	0.025	0.000
Mean soil productivity (index)	–0.004	0.002	0.053
Atlantic region	0.200	0.107	0.061
Southern region	0.294	0.116	0.011
Plains region	0.154	0.108	0.154
Midwest region	0.125	0.127	0.324
Sample	10,602		
Log-likelihood	–1,213.83 (505.08***)		
Likelihood ratio test	p-value (LR = 0) < 0.000		

Note: *** denotes statistically significant at the 1 percent level. Small farm: farm with gross cash income less than $250,000. Large farm: farm with gross cash income of more than $250,000.

Table 4. Probit Model Parameters for Large Farms – *Dependent Variable*: Participation in Agritourism

Variable	Coefficient	Standard Error	p-Value
Primary job: farming	–0.370	0.130	0.004
Operator age	0.007	0.003	0.021
Educational attainment of operator	0.081	0.018	0.000
Female	0.066	0.210	0.754
Total acres (log)	0.269	0.025	0.000
Government payment	–0.095	0.087	0.275
Livestock farm	0.425	0.077	0.000
High-value-crop farm	0.378	0.123	0.002
Median income	0.000	0.000	0.009
Amenity (index)	0.040	0.046	0.382
Number of agritourism farms in 2007 in the county	0.018	0.003	0.000
County population (log)	–0.117	0.031	0.000
Mean soil productivity (index)	0.002	0.003	0.391
Atlantic region	0.105	0.115	0.360
Southern region	0.077	0.134	0.566
Plains region	0.035	0.120	0.773
Midwest region	0.034	0.140	0.806
Sample	6,984		
Log-likelihood	–857.06 (395.47***)		
Likelihood ratio test	p-value (LR = 0) < 0.000		

Notes: *** denotes statistically significant at the 1 percent level. Small farm: farm with gross cash income less than $250,000. Large farm: farm with gross cash income of more than $250,000.

variables were found to be insignificant in the case of small farms. However, the results presented in Table 3 indicate that, for small farms, a higher mean soil productivity index has a negative significant effect on participation in agritourism. This finding makes sense because productive farm land would most likely be devoted to production of farm outputs, a more profitable use of such land.

In the case of large farms, the results reported in Table 4 show that operators who listed farming as their occupation were less likely to participate in agritourism. In addition, the coefficients for female operators and government payments were no longer significant. Finally, none of the regional location variables was significant in the case of large farms.

Average Treatment Effect for the Treated

Using the propensity score, we conduct the nearest-distant matching analysis to facilitate matching of observations in the treated group with observations in the control group. We estimate ATT using $m = 1, \ldots, 5$ and report the results in Table 5 for each matched number. The ATT analysis is conducted for three types of sub-samples—all farms, small farms, and large farms—on ROA, THI, and NFIPOA.

Table 5. Estimates of the Average Treatment Effect for the Treated

	Return on Assets			Total Household Income			Net Farm Income per Owned Assets		
Matched Number	Est.	Std Error	p-Value	Est.	Std Error	p-Value	Est.	Std Error	p-Value
All Farms									
$m = 1$	0.0179	0.0160	0.263	–38,014	40,675	0.350	0.1306	0.1416	0.357
$m = 2$	0.0168	0.0158	0.288	–18,222	31,322	0.561	0.1055	0.1435	0.462
$m = 3$	0.0168	0.0158	0.288	–4,816	25,422	0.850	0.1119	0.1411	0.428
$m = 4$	0.0170	0.0158	0.282	–4,889	23,151	0.833	0.1181	0.1401	0.399
$m = 5$	0.0173	0.0158	0.272	–19,735	23,590	0.403	0.1210	0.1396	0.387
Small Farms									
$m = 1$	0.0046	0.0041	0.261	14,695	13,148	0.264	0.0248	0.0105	0.018
$m = 2$	0.0026	0.0035	0.468	16,571	11,577	0.152	0.0230	0.0090	0.011
$m = 3$	0.0038	0.0030	0.100	14,460	11,941	0.226	0.0153	0.0083	0.067
$m = 4$	0.0044	0.0027	0.101	16,524	11,367	0.101	0.0140	0.0079	0.077
$m = 5$	0.0024	0.0028	0.405	19,043	11,047	0.085	0.0172	0.0078	0.028
Large Farms									
$m = 1$	0.0373	0.0375	0.320	–72,103	94,014	0.443	0.2863	0.3348	0.392
$m = 2$	0.0364	0.0371	0.326	–62,430	73,000	0.392	0.2117	0.3395	0.533
$m = 3$	0.0343	0.0371	0.354	–33,334	58,856	0.571	0.2470	0.3319	0.457
$m = 4$	0.0339	0.0370	0.360	–90,863	59,444	0.100	0.2459	0.3302	0.456
$m = 5$	0.0342	0.0370	0.356	–90,565	53,714	0.092	0.2560	0.3292	0.437

Notes: Small farm: farm with gross cash income less than $250,000. Large farm: farm with gross cash income of more than $250,000.

In the all-farms group (Table 5), the ATTs on ROA, THI, and NFIPOA were not significant. This suggests that participation in agritourism has no significant effect on ROA, THI, and NFIPOA. Similarly, the ATTs on ROA and NFIPOA were not significant for large farms. The average treatment effect on THI for large farms was negative and significant at $m = 4$ and $m = 5$, indicating that large farms may incur losses from participation in agritourism enterprises. The range of ATT on THI for $m = 4$ and $m = 5$ is –90,863 to –90,565 and significant at a 10 percent level. Thus, large farms participating in agritourism tended to incur a loss of between $90,000 and $91,000 in total household income. Consequently, large farms may not benefit from adopting agritourism and perhaps would be better suited to growing cash grain crops and exploiting economies of scale and scope. The additional degree of income risk faced by large-scale farm operations could be best managed using other tools, such as government program payments and/or crop insurance.

In the case of small farms, the ATT is significant on ROA, THI, and NFIPOA, which indicates that, as the scale of a farm decreases, the likelihood of inclusion of agritourism increases. These results indicate that small-scale farmers are deriving greater financial rewards from agritourism than are operators of large farms. Perhaps operators of large farms generally do not charge agritourism fees and include agritourism primarily for public relations. They also may receive

government payments in the case of income shocks while small-scale farmers who likely depend on agritourism as a source of income would charge entry or tourism fees.[14] Agritourism can be a vital enterprise that small-scale farmers can use to diversify their incomes and to improve both their households' well-being and their businesses' economic performance.

Our results suggest that small farms that participate in agritourism earn higher ROA, THI, and NFIPOA than farms that do not. The range of the ATT on ROA for $m = 3$ and $m = 4$ is 0.0038 to 0.0044. Therefore, an additional 0.38 percent to 0.44 percent in ROA is associated with farms that participate in agritourism. This is a significant return for small-scale farmers when one considers that ROA for such farmers generally ranges from –5.0 percent to –0.4 percent (Hoppe and Banker 2010). Table 5 shows that the ATT on THI for $m = 4$ and $m = 5$ ranges from \$16,524 to \$19,043; that is, an additional \$16,524 to \$19,043 of total household income for a small farm is associated with participation in agritourism. Our findings agree with those of Somoza (2011), which reported that small-scale farmers engaged in agritourism in the southeastern United States in 2007 generated an average of \$24,276 in income from agritourism enterprises, up more than 230 percent from 2002.

Finally, the results reported in Table 5 show that small-scale farmers participating in agritourism earn a greater NFIPOA. The ATT on NFIPOA for all m ranges from 0.014 to 0.025. Thus, an additional 1.4 percent to 2.5 percent in NFIPOA is associated with participation in agritourism. The results suggest that, for every dollar of owned assets, small-scale farmers were able to generate more than a dollar in net farm income. Perhaps operators of small farms who participate in agritourism are efficiently and effectively using their assets to generate additional farm income. Our results demonstrate that small-scale farmers can benefit from participating in agritourism because it allows them to diversify their income sources despite having limited resources.

Summary and Conclusions

The decline in the ability of farmers in general and small-scale farmers in particular to generate sufficient income has caused many farmers to seek new sources of income and diversification of their agricultural bases. Agritourism is an alternative farming enterprise and source of income that can improve a farm household's well-being and economic performance, particularly for operators of small farms. This study examined whether farmers benefit from participation in agritourism in terms of return to assets, total household income, and net farm income per dollar of owned assets. Instead of the conventional parametric approach, we employed a nonparametric approach and used the nearest-neighbor matching method to estimate the average treatment effect of agritourism on the financial performance of farms. The matching estimator allowed us to assess the marginal effect of being an agritourism farmer on the financial performance of farms without specifying functional forms or making assumptions about the conditional distributions of the dependent variables.

We conducted three separate analyses: all farms, small farms (less than \$250,000), and large farms (greater than \$250,000). Our results for all farms

[14] Tew and Barbieri (2012) reported cases in which farmers involved in agritourism did not charge an agritourism fee. Also, operators of large farms tend to specialize in wildlife-based recreation. These ventures provide access to natural areas for hunters and anglers as well as for a growing number of wildlife-viewing enthusiasts.

and large farms revealed that agritourism's effect on return on assets, total household income, and net farm income per dollar of owned assets was not significant. For small farms, however, agritourism increases farmers' return on assets, total household income, and net farm income per dollar of owned assets. Those farms can obtain a 0.4 percent higher return to assets and $16,524 to $19,043 in additional income. We find that agritourism is helpful in increasing the economic well-being of small-scale operators and thus improving their sustainability.

There are several implications of this study. The vast majority of farms are located in primarily rural areas, and agritourism can play an important role in rural tourism, which significantly affects rural economies in many Western nations. Rural tourism has an important role in diversifying the income of farm households and thus strengthening and stabilizing the rural economic base, especially in areas in which agriculture as an occupation is declining. In addition, agritourism can enhance the value of local resources and preserve traditional sectors (complemented by local manufacturing and services) while simultaneously generating publicity for local products and demand for onsite casual and permanent labor. Our results help to identify the types of farms and farmers best suited to undertaking agritourism enterprises, information of use to both farmers and policymakers.

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