Income of Farmers Who Use Direct Marketing

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Policy makers are looking for ways to preserve farmlands, especially near urban areas. Farmers are also trying to find ways to increase their farm income by incorporating non-traditional activities into their farm routine. This paper attempts to quantify the contributions of selected nontraditional activities towards farmers' efforts to enhance their farm income. For farmers involved in direct marketing, a logit model is used to estimate the probability of attaining *high income* for each activity considered. The results indicate that activities such as agrotourism, direct retailing to consumers, selling of farm related value-added products, greenhouse operations and urban location of farm markets will increase the chance of attaining *high income* levels.

Farmland and agriculture are a valuable wealth to the northeastern states. They contribute to the economy through employment and economic diversity, and to quality of life through the uniqueness of the rural atmosphere they generate (Adelaja et al. 1994). However, farmers of the region are faced with a number of challenges which include, but are not limited to, high input costs, excessive regulatory burden, increasing competition in the output markets and rapidly appreciating land values resulting from expansion of industrial and service sectors (Adelaja 1995; Tavernier et al. 1996). As more and more farmlands are being transformed from agricultural to suburban and urban uses, farmers are finding it increasingly difficult to compete with non-agricultural activities as farm income continues to lag behind. Policy makers in the region are searching for ways to help farmers remain economically viable so that they continue to remain in agriculture (Govindasamy and Nayga 1996) and help preserve the rural lifestyle and open space generated by farming activities. Farmers are also trying to find ways to increase their farm income by incorporating nontraditional activities into their farm routine.

Farm income is generated primarily through retail and wholesale sales of produce. The income from retail sales comes primarily from the direct marketing of produce to the consumers. Several studies have found that farmers are increasingly utilizing direct marketing to consumers as a way to increase their farm income (Cartier 1994; Govindasamy 1996[a] and 1996[b]; Nayga Jr. et al. 1995; and Schooley et al. 1989). A recent study conducted in New Jersey indicates that average gross sales were roughly $221,000 per operation and the direct marketing industry is valued at approximately $189 million (Nayga Jr. et al. 1994). The direct marketing channels include retail outlets such as temporary farmstands, wagons, pick-your-own operations, greenhouses and garden centers.

In recent years farmers in the northeastern states have diversified into several new directions as part of their ongoing efforts to increase farm income. For instance, a recent study finds that New Jersey farmers are trying to generate supplemental income by providing agrotourism activities (Govindasamy et al. 1997). These activities include organizing farm tours, hayrides, festivals, petting zoos, and providing on-farm picnic facilities. These activities provide people, especially children, educational and entertaining farm life experiences and offer the urban communities a retreat from the congestion of the cities (Adelaja 1995). These activities primarily utilize existing farm resources and thus offer the farmers the potential to substantially increase their farm income without substantial additional investments.

Studies on consumers' attitudes have shown that buyers are increasingly demanding better quality of fresh fruits and vegetables, and are willing to pay premium prices for higher quality foods (Connel et al. 1986; Eastwood et al. 1986; Rhodus et al. 1994). In addition, the growing awareness among consumers of health and environmental hazards as-

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sociated with synthetic agricultural inputs has created a demand for specialized produce (Govindasamy et al. 1997). Consumers today are demanding safer food supply and are willing to pay a premium to ensure safety of the food items they purchase. Some farmers are taking advantage of the emerging markets for such products by supplying products such as organic produce, Integrated Pest Management (IPM) produce and naturally ripened produce. The incorporation of new environmentally friendly farming methods has offered farmers the opportunity to pursue high-profit production alternatives in place of conventional production practices. In addition, farmers are increasingly providing various farm related products such as home-made jams, pies, bread, flower bouquets, etc., through direct markets (Nayga Jr. et al. 1994). These value-adding activities provide the farmers the opportunity to earn extra income by catering to consumers' demand.

Given the competitive pressure in the marketplace, it is imperative that farmers with limited resources find and implement alternative activities that have the potential of yielding higher income per acre of agricultural land. Today farmers need to implement farm business diversification, product differentiation and produce promotion not only to increase their income but also to reduce the risk associated with non-diversified single business of conventional farming. Using data from a survey of New Jersey farmers engaged in direct marketing, this paper attempts to quantify the contributions to the farm income of various non-traditional marketing activities such as direct marketing, agrotourism, marketing of organic and other farm related products, and of other factors such as the stage of business, location, zoning and advertising expenditures. A logit model was used to estimate the probability of attaining higher income for each activity considered. The results of the study would help farmers select those activities with greater potential for attaining higher income levels.

Conceptual Framework

This study utilizes a logit model to estimate the probability of a farmer attaining a higher than average farm income by engaging in various non-traditional marketing and other activities. The logit approach measures the magnitude of the effects of independent variables on qualitative dependent variable. In this framework, the likelihood of an activity generating a higher than average income is modeled as a function of a set of predetermined variables. Since the dependent variable is binary in nature, a qualitative choice model is used in the analysis. The model is estimated using the maximum likelihood (ML) procedure because of the inherent large sample properties of consistency and asymptotic normality.

The model assumes that the probability of a farmer attaining a *high income*, P_i, depends on a vector of independent variables (X_{ij}'s) associated with the farmer i and variable j, and a vector of unknown parameters β's. A dependent variable y_i is defined as a dichotomous random variable such that $y_i = 1$ if the income of the farmer is above some predetermined value (in dollars), and $y_i = 0$ otherwise. For the logit model, the probability of attaining *high income* (i.e., $y_i = 1$) is given by:

$$(1)\quad P_i = F(Z_i) = F(\alpha + \beta X_{ij}) = 1/[1 + \exp(-Z_i)]$$

where

$F(Z_i)$ = the value of the cumulative logistic function associated with each possible value of the underlying index Z_i;
P_i = probability that a farmer will have a high income or not, given the knowledge of various factors X_{ij}'s;
exp = base of natural logarithm;
Z_i = underlying index number of βX_{ij};
β = a vector of unknown parameters.

The underlying index number, βX_{ij}, is a linear function of the independent variables. Thus,

$$(2)\quad Z_i = \log[P_i/(1 - P_i)] = \beta_0 + \beta_1 X_{11} + \beta_2 X_{12} + \ldots + \beta_n X_{1n} + \varepsilon$$

where

i = 1, 2, . . . , I denotes the individual farmers;
j = 1, 2, . . . , n represents the independent variables;
X_{ij} = the jth explanatory variable associated with the ith individual farmer;
β = the parameters to be estimated;
ε = error term or disturbance term.

The dependent variable in the above equation is the logarithm of the odds that a randomly chosen farmer belongs to the *high income* category. The parameters themselves do not directly represent the effects of changes in the independent variables on the probability of attaining the *high income*. Such probability changes depend on the original probability and thus on the initial values of all the independent variables and their coefficients. In the logit model, the change in probability that $y_i = 1$ (i.e., P_i) due to a change in the independent variable, X_{ij}, is given by:

$$(3)\quad (\partial P_i/\partial X_{ij}) = [\beta_j \exp(-\beta X_{ij})]/[1 + \exp(-\beta X_{ij})]^2$$

However, when there are independent variables that are qualitative in nature, as is true for many of the explanatory variables included in the analysis, $(\partial P_i/\partial X_{ij})$ does not exist because the X_{ij}'s are discrete and cannot vary continuously. Hence, probability changes must be obtained by evaluating P_i at alternative values of X_{ij}. Therefore,

(4)
$$(\partial P_i/\partial X_{ij}) = [P_i(Y_i; X_{ij} = 1) - P_i(Y_i; X_{ij} = 0)]$$

The empirical model is specified as:

(5)
$$\begin{aligned} \text{Prob}_i = {} & \beta_0 + \beta_1 \text{ Tours} + \beta_2 \text{ Festivals} \\ & + \beta_3 \text{ Initial Stage} + \beta_4 \text{ Mature Stage} \\ & + \beta_5 \text{ Organic Produce} + \beta_6 \text{ Retail} \\ & + \beta_7 \text{ Urban} + \beta_8 \text{ Value-Added Product} \\ & + \beta_9 \text{ Commercial Zone} \\ & + \beta_{10} \text{ Temporary Outlets} \\ & + \beta_{11} \text{ Greenhouses} + \beta_{12} \text{ Garden Centers} \\ & + \beta_{13} \text{ Pick-Your-Own} \\ & + \beta_{14} \text{ Advertising Expense} \end{aligned}$$

where

Prob_i = 1 if an individual farmer belongs to the *high income* category, and 0 otherwise.

Tours = 1 if the farmer is engaged in activities such as organizing farm tours, hayrides, or providing on-farm picnic facilities, and 0 otherwise.

Festivals = 1 if the farmer undertakes activities such as farm festivals or petting zoos for customers, and 0 otherwise.

Initial Stage = 1 if the farm business is in the initial stage of development, and 0 otherwise[1].

Mature Stage = 1 if the farm business is in the mature stage of development, and 0 otherwise.

Organic Produce = 1 if the farmer grows and/or sells organic produce, and 0 otherwise.

Retail = 1 if the farmer sells his/her output primarily through retailing[2], and 0 otherwise.

Urban = 1 if the location of the market used by the farmer is in an urban or suburban area, and 0 otherwise.

Value-Added Product = 1 if the farmer sells other value-added products such as jams, pies, flower pots etc., and 0 otherwise.

Commercial Zone = 1 if the market used by the farmer is located in a commercial zone, and zero otherwise.

Temporary Outlet = 1 if the farmer retails farm products through temporary facilities such as strands, wagons, etc., and 0 otherwise.

Greenhouses = 1 if the farmer retails farm products through greenhouse facilities, and 0 otherwise.

Garden Centers = 1 if the farmer retails farm products through nursery or garden center, and 0 otherwise.

Pick-Your-Own = 1 if the farmer sells farm produce through pick-your-own, U-pick, Choose & cut, etc., and 0 otherwise

Advertising Expense = Annual advertising expenditure incurred by the farmer (a continuous variable).

At the estimation stage, one classification was eliminated from each of the binary independent variables defined above. The base group of farmers are those satisfying the following description: those direct marketers not engaged in activities such as organizing farm tours, hayrides, farm festivals, petting zoos, or providing on-farm picnic areas; whose business is in the declining stage of development; who do not grow and/or sell organic produce; those who do not depend on retailing as the primary outlet for their produce; whose market is located in a rural areas; those not involved in producing and marketing value-added products such as jams, pies, bread etc., whose market outlet is located in non-commercial zone; those not utilizing retail channels such as temporary stands, greenhouses, nurseries, garden centers or pick-your-own operations; and those not engaged in advertising.[3]

Data Description

In 1992, a survey was conducted on New Jersey farmers to collect information on characteristics of farmers. The questionnaire was developed by the Rutgers Cooperative Extension, in cooperation with the research personnel at the New Jersey Agricultural Experiment Station, the New Jersey Department of Agriculture, the New Jersey Farm Bureau, and the New Jersey Farmers' Direct Marketing Association. A total of 1,055 questionnaires were mailed to farmers of which 557 were returned. One hundred of the returned questionnaires were from businesses that were no longer in operation due to various reasons, and two were returned at a later date after compilation. Hence, a total of 455 completed questionnaires was used in the present study.

Table 1 provides the descriptive statistics of the independent variables used in logit analysis. The dependent variable is assigned a value of 1 if the farmer in question attains *high income* level (defined below), and 0 otherwise. Gross sales per acre is used as a measure of gross farm income. Ideally, one would like to define farm income as a continuous variable. However, as is well known, farmers are seldom able and/or willing to reveal their actual income. Reported income figures are usually not very reliable. In addition, survey response usually falls, sometimes quite sharply, when respondents are asked to report their income in exact dollar values. In the interest of higher farmers' participation, the survey design asked farmers to report their gross income within predefined broad categories instead of exact dollar figures. Consequently, the survey data did not allow the income variable to be treated as a continuous variable. Hence, a binary dependent variable is used in the empirical analysis.[4]

Table 1. Descriptive Statistics for the Independent Variables Used in Analysis[a,b,c]

Variable	Description	Farmers' Participation (%)	High	Low	Mean
Tours	Farmers providing farm tours, picnic areas, hayride, etc.	43.0	1	0	0.5
Festivals	Farmers providing activities like festivals and petting zoo	22.0	1	0	0.5
Initial Stage	Farmers in the initial stage of development	7.0	1	0	0.5
Mature Stage	Farmers in the mature stage of development	77.0	1	0	0.5
Decline Stage	Farmers in the declining stage of development	10.0	1	0	0.5
Organic Produce	Farmers growing and/or selling organic produce	12.0	1	0	0.5
Retail	Predominantly retailing farmers (see footnote 1)	79.0	1	0	0.5
Urban	Markets located in urban or suburban area	45.0	1	0	0.5
Value-Added Product	Farmers selling farm related value-added products	42.0	1	0	0.5
Commercial Zone	Market outlet located in commercial zone	58.0	1	0	0.5
Temporary Outlet	Retail through temporary facilities like stands, wagons, etc.	35.0	1	0	0.5
Greenhouses	Retail farm products through greenhouses facilities	22.0	1	0	0.5
Garden Centers	Retail farm products through nursery/garden centers	13.0	1	0	0.5
Pick-Your-Own	Engaged in Pick-Your-Own, U-pick, etc. operations.	33.0	1	0	0.5
Advertising Expense	Annual average advertising expenditure (all respondents)	2170.22	50000	0	2170.22

[a]Except for the annual average advertising expenditure and stage of business development, all variables reported above are binary response variables. The percentage value reported above refers only to the percentage of survey respondents who answered in the affirmative to the questions asked. The variables reported above are those that are included in the estimation process. The variables corresponding to negative response are the omitted variable category in the analysis.
[b]In case of business stage development variable, the variable category corresponding to declining stage is omitted.
[c]Variable annual average advertising expenditure is a continuous variable, and it includes all respondents.

Table 2 presents descriptive statistics on the income variable used to construct the binary choice dependent variable. The binary dependent variable (defined as $y = 1$ if the farmer is in the *high income* group, otherwise $y = 0$) was constructed using two alternative definitions of *high income.* Two separate models were estimated for the two sets of the (binary) dependent variable. The *base model* classifies farmers with gross income greater than or equal to $1,200 per acre (the median income level) to be in the high income category and those with income below $1,200 are identified to be in the low income category. The $1,200 level translates into a total farm income of $111,000 for the average farm in the sample. The choice of $1,200 per acre of farm income as the cut off point is in line with the New Jersey agricultural census data on farm income.[5] The second model, or the *narrow-range high income model,* sets the cut-off income level for high income classification at a much higher level. Specifically, this model defines farmers with gross farm income per acre greater than or equal to $4,166 (the 75% percentile value in the income distribution for the sample) to be in the high income category and those with income below this level are classified in the low income category.

Among the explanatory variables, agrotourism activities are separated into two variables on the basis of investment requirements. Activities such as organizing farm tours, and hayrides, and providing on-farm picnics are grouped under the variable 'Tours.' These activities generally require very little additional investment as they mostly utilize existing farm resources. Activities such as organizing festivals and petting zoos are grouped together under the variable 'Fest.' Compared to the activities included under the variable 'Tours,' these activities require additional investments in terms of establishment, care and maintenance.

Table 2. Descriptive Statistics for the Dependent Variable Used in the Analysis

Range of Income Variable	Midpoints	Frequency
$0–9,999	5,000	171
$10,000–24,999	17,500	59
$25,000–49,999	37,500	46
$50,000–99,999	75,000	40
$100,000–249,999	175,000	61
$250,000–499,999	375,000	32
$500,000–749,999	625,000	12
$750,000–999,999	875,000	8
$1,000,000–1,999,999	1,500,000	14
$2,000,000–4,999,999	3,500,000	3
$5 million and more	5,000,000	3

Empirical Results

This section presents the results of the logit analysis that attempt to estimate the probability of attaining *high income* levels by incorporating various non-traditional activities into the farm routine. Results are reported both for the *base model* as well as for the *narrow-range high income model.*

The Base Model

The maximum likelihood estimates for the base model (where high income farmers are those with income above the median income level for the sample, or $1,200) are presented in table 3. The results show that among the explanatory variables, direct retailing, utilization of market outlets in the urban areas and commercial zones, selling of farm related value-added products, utilization of garden center facilities and pick-your-own type operations have effects that are statistically significant at 10% level or better. All but one of the statistically significant variables have positive contributions towards a farmer's attaining high income level. The only exception is pick-your-own type operation which reduces the probability of a farmer attaining the high income level.

Table 3 also reports the estimated change in the probability of attaining high income level for each of the statistically significant explanatory vari-

Table 3. Maximum Likelihood Estimates of the Base Logit Model (Gross income ≥$1,200/acre)

Variable	Estimate	SE	Change in Probability
Intercept	−2.1648*	0.5053	−0.5372
Tours	0.2708	0.3073	na
Festivals	0.4693	0.3795	na
Initial Stage	0.0364	0.5776	na
Mature Stage	0.1814	0.3788	na
Organic Produce	−0.2604	0.3912	na
Retail	1.2495*	0.3784	0.3100
Urban	0.4930*	0.2653	0.1223
Value-Added Product	0.6235*	0.2830	0.1547
Commercial Zone	0.6683*	0.2717	0.1658
Temporary Outlet	−0.2325	0.2769	na
Greenhouses	0.5647	0.3776	na
Garden Centers	1.9843*	0.6234	0.0423
Pick-Your-Own	−0.9311*	0.3322	−0.2310
Advertising Expense	0.000063	0.000049	0.00001559
McFadden's R^2	0.22		
Ratio[a]	0.51		

[a]Ratio of non-zero observations to the total number of observations.
*Indicates statistical significance at the 0.10 level.

ables.[6] It can be seen from table 3 that farmers who sell their produce primarily through retailing are 31% more likely to be in the high income category compared to those not engaged in direct retailing to consumers. This may be explained by the fact that direct retailing to consumers eliminates the middlemen from the produce business. By selling directly to the consumers and thereby eliminating the middlemen's commissions, farmers keep for themselves what consumers pay for their produce. Thus, direct retailing allows farmers to receive a higher net price and higher returns. The results also show that farmers utilizing market outlets in the urban areas and in commercial zones are, respectively, 12% and 16% more likely to attain high income level compared to those utilizing markets in the rural areas. This is perhaps due to the fact that there is a higher demand for fresh produce in the densely populated urban and suburban areas. Being conveniently located near markets with higher demand allows these farmers to sell their fresh produce at a relatively higher price compared to those serving markets in the rural areas. Although proximity to urban areas has drawbacks in terms of higher land value and the possibility of higher regulatory burden, it also offers farmers better access to markets and the potential for higher prices.

Among other significant variables, results show that farmers who sell farm related value-added products such as jams, pies, bread etc., are 15% more likely to be in the high income category compared to those who do not sell any such products in addition to conventional farm products. Estimated probability changes also indicate that farmers using operations such as pick-your-own (PYO) are 23% less likely to be in the high income category compared to those not engaged in these operations. Since these operations eliminate middlemen, as does direct retailing, the negative effect of PYO operations may seem counter-intuitive. However, these operations are available only for certain periods of the year and for certain seasonal products, depend on good weather condition during harvest period, and demand more of buyers' time. Consequently, returns from such operations tend not to be cash intensive. The only other significant variable is the utilization of garden centers: farmers utilizing garden centers are about 4% more likely to be in the high income category compared to those not utilizing such facilities. These facilities allow farmers to produce specialty cash crops that are generally sold at a premium price (i.e., at a higher profit margin) and thus help producers attain higher income levels.

The goodness of fit for the model is shown by the McFadden's R^2 of 0.22. The extent of prediction is shown in the classification table (table 4). Approximately 68.6% of the survey participants were correctly classified as either high income earners per acre of farm or low income earners using the logit specification.

Narrow Range High Income Model

The maximum likelihood estimates for the narrow-range high income model are presented in table 5. The results show that more explanatory variables are statistically significant (at 10% level) in this model compared to the base model. The statistically insignificant variables are stage of business, selling of organic produce, using market outlets in commercial zones, and advertising expenditure. Among the significant variables, marketing through temporary facilities (such as wagons, carts, etc.) and pick-your-own operations reduce a farmer's probability of attaining high income level. All other significant variables have positive effects on a farmer's probability of attaining high income category.

Results reported in table 5 show that farmers engaged in providing agrotourism activities such as festivals and petting zoos are 12% more likely to be in the high income group than others who do not participate in these activities. Similarly, farmers who sell their products primarily through direct retailing are 14% more likely to be in the high income category compared to those who are not primarily retailers. This probability estimate is less than half of the estimated probability for a predominantly retailing farmer being in the high income category in the base model (14% in the narrow-range high income model vs. 31% in the base model). This suggests that although direct retailing helps farmers attain above average income levels, it is less effective in attaining income levels above 75th percentile value.

The results further indicate that farmers utilizing markets in the urban and suburban areas are 12% more likely to be in the high income category com-

Table 4. Prediction Success of the Base Model (Gross Income ≥$1,200/acre)

		Predicted	
		0	1
Actual	0	110	54
	1	51	119
Number of right predictions		= 229	
Percent of right predictions		= 68.6	

Table 5. Maximum Likelihood Estimates of the Logit Model for Narrow-Range High Income Model (Gross income ≥$4,166/acre)

Variable	Estimate	SE	Change in Probability
Intercept	−2.9935*	0.6670	−0.4113
Tours	−0.5094	0.3679	na
Festivals	0.9255*	0.4711	0.1271
Initial Stage	0.1480	0.7523	na
Mature Stage	−0.2008	0.4803	na
Organic Produce	0.1108	0.4732	na
Retail	1.0745*	0.4923	0.1476
Urban	0.9038*	0.3377	0.1241
Value-Added Product	0.6377*	0.3487	0.0876
Commercial Zone	0.4818	0.3688	na
Temporary Outlet	−0.8062*	0.3796	−0.1107
Greenhouses	0.9232*	0.3937	0.1268
Garden Centers	2.7548*	0.5414	0.3784
Pick-Your-Own	−2.0178*	0.5111	−0.2772
Advertising Expense	0.000038	0.000034	na
McFadden's R^2	0.35		
Ratio[a]	0.25		

[a]Ratio of non-zero observations to the total number of observations.
*Indicates statistical significance at the 0.10 level.

pared to those using markets in rural areas. This prediction is similar to that obtained for the base model. Similarly, farmers who sell farm related value-added products such as jams, pies, bread etc., are 8% more likely to be in the high income category than those who do not sell these products. This probability is about 7% less than the probability change associated with the selling of farm related value-added products for the base model.

Utilization of greenhouse facilities increases a farmer's probability of attaining high income category by about 12%. This activity had statistically insignificant effect in the base model. The biggest positive contribution towards attaining income levels above the 75th percentile comes from the utilization of garden center facilities. As can be seen from table 5, farmers using garden center facilities have about 38% higher probability of attaining the high income category compared to those not using these facilities. Thus, utilization of greenhouses, and nurseries and garden centers appears to offer the best potential for attaining high farm income.

The results in this model indicate that farmers using marketing outlets that are temporary in nature such as stands, wagons, tables etc, are 11% less likely to be in the high income category compared to those who do not use these facilities. This may be due to the fact that farmers employing such temporary facilities sell only seasonal produce and are limited to small local areas. This variable did not have a statistically significant effect in the base model. Finally, similar to results found in the base model, farmers with pick-your-own (PYO) operations are 27% less likely to be in the high income category compared to those who do use such operations.

The goodness of fit for the model is shown by the McFadden's R^2 of 0.35. The extent of prediction is shown in the classification table (table 6). The estimated model correctly classified approximately 83.2% of the survey participants in their respective income category.

Concluding Comments

Farmers today are looking for ways to increase income by increasing productivity as well as by incorporating non-traditional alternative activities in addition to conventional farm operations. These alternatives not only help farmers increase their income but also reduce the risks associated with reliance on the single business of selling produce. This study attempts to estimate the contributions of various non-traditional farm activities towards farmers' efforts to earn higher income levels. The results of the study should help farmers with limited resources to choose activities that have the greatest potential of yielding higher income levels.

The study indicates that among different agrotourism alternatives, activities such as arranging farm festivals, and organizing petting zoos are effective ways of attaining higher income levels than other activities. Similarly, direct retailing seems to be an effective way to increase farm income. This is reflected by the study result that farmers who sell their product primarily through direct retailing are consistently more likely to attain high income levels compared to those who do not utilize this marketing option. Farmers utilizing markets in urban and suburban areas or commercial zones are better positioned than those serving rural markets in terms of the probability of attaining higher income levels. The study finds that garden centers,

Table 6. Prediction Success of the Narrow-Range High Income Model (Gross Income ≥$4,166/acre)

		Predicted	
		0	1
Actual	0	235	43
	1	13	43
Number of right predictions		= 278	
Percent of right predictions		= 83.2	

nurseries, and greenhouses are the most effective ways to enhance farm income. This is reflected by the result that these operations consistently increase the farmers' chances of attaining high income category in both the base model as well as the narrow-range high income model. However, the study suggests that activities such as pick-your-own (PYO) operations and temporary facilities such as stands, wagons, tables, etc., are not effective ways to boost farm income as these activities reduce a farmer's chances of attaining higher income levels.

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Notes

1. Survey respondents identified their farm businesses in one of the three stages: growing, mature, or declining stage.
2. The variable is set to 1 if more than 50% of the dollar value of products is sold through retailing, and 0 otherwise.
3. Given that the dependent variable is income per acre, the inclusion of an acreage variable is tantamount to including an economies of scale factor. Under the assumption of perfect competition in agricultural produce markets, economies of scale cannot influence the price. The acreage variable was insignificant when included in the Logit regression. Therefore, the final model presented does not include the acreage variable.
4. The conversion of the income variable into a continuous variable format would have required choosing the midpoint between the lowest and highest values within an income range as the income for all farmers falling within that range. This would clearly lead to a form of heteroschedasticity and errors in variable that is difficult to detect or correct for. Within an income range, residuals will be correlated with independent variable. The alternative is to design the survey to report actual income. As suggested above, this could lead to erroneous numbers (error in variable) and a low response rate. The logit approach minimizes errors in variable and heteroschedasticity.
5. In New Jersey, 88% of farmers generate less than $100,000 in sales. However, most of the state's successful direct marketing commercial farms fall in the over $100,000 range.
6. Probability changes have not been computed for the variables that have statistically insignificant effects.