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Direct-to-Consumer Marketing by U.S. Farms

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Abstract

This study analyzes the dynamics of direct-to-consumer marketing by U.S. farms using data from the U.S. Census of Agriculture. We analyze transition probabilities across categories of states based on the value of direct-to-consumer sales. Census-to-Census transition matrices shows high transition rates toward no direct sales amongst farmers. Our findings indicate that farmers do not necessarily have a strong commitment to direct-to-consumer marketing channels, particularly for very small farms that are also livestock farms. Probit models indicate that farmers who continue to engage in direct marketing are more likely to have a higher proportion of direct-to-consumer sales to all sales, are more likely to produce fruit or vegetables and less likely to produce livestock in comparison to other crops, and are more likely to be larger farms. These results inform policy makers about the dynamics in direct-to-consumer marketing by U.S. farmers.

Keywords: direct marketing, direct-to-consumer marketing, local foods

JEL: Q13

I. Introduction

Consumer interest in locally produced foods has been increasing in the U.S. (Kingsolver, Hopp, and Kingsolver, 2007 and Pollan, 2008). According to the 2012 Census of Agriculture and the Agricultural Resource and Management Survey (ARMS), the estimated value of total local food sales exceeded \$6 billion, or 7.8% of all food sales by U.S. farms. These sales include sales directly to consumers through farmers' markets, community supported agriculture (CSA), road stands etc., and sales through intermediated marketing channels, e.g., sales to groceries, restaurants and food hubs. Sales through intermediated marketing channels account for nearly half of local food sales and attract large farms while smaller-scale growers (with less than \$50,000 in total sales) most likely participate exclusively in direct-to-consumer channels (Low and Vogel, 2011). Interestingly, Low et al. (2015) show that while the number of farms involved in direct-to-consumer marketing has been increasing, the value of direct-to-consumer sales from 2002 to 2012 Census year remained unchanged when adjusted for inflation.

Different consumers may have different opinions on the definition of "local." King et al. (2010) define local food product as one that is raised, produced, and processed in the locality or region where the final product is marketed. Darby et al. (2008) estimate consumer demand for fresh strawberries to understand the geographical extent of "local". They find that consumers do not distinguish between "grown nearby" and "grown in Ohio", which confirms findings of The Hartman Group study where 79% of consumers identify "local" as in-state produced (The Hartman Group, 2009).

Farmers' markets are one of the most popular forms of direct marketing by small farmers. While the number of farmers' markets in the U.S. doubled over the last decade: from 4,385 in 2006 to 8,674 in 2016, it increased only by 6.5% in the last three years (National Farmers' Market Directory, USDA Ag Marketing Service). CSA is another alternative to get locally grown produce which allows a farmer to spend time marketing the food and receive payment early in the season. As of September 2016, Local Harvest reported 6,768 active CSAs for the U.S. Note that there is a big discrepancy in the number of reported CSAs by Local Harvest and USDA Ag Marketing

Service's Directory which reported 733 active CSAs. Inwood et al. (2008) and Tropp (2008) identify the lack of convenience as the main challenge to the growth of direct marketing channels.

Direct marketing presents opportunities for those farmers who receive low farm-gate prices as they can charge retail prices for their produce without going through middlemen. Key (2016) also reports that farms that market directly to consumers through farm stands, farmers' markets, or CSAs have higher business survival rate which can be explained by their lower debt-to-asset ratios. Farmers with direct sales purchase less machinery and land. Therefore, they have lower annual interest payments: \$7.85 per \$1,000 of owned assets, compared with \$10.55 for farmers with no direct sales. At the same time, a survey conducted by Watson and Gunderson (2010) for the farmers' markets in Florida show that prices for products at farmers' markets are lower than in nearby retail food stores. Low et al. (2015) in their nation-wide comparison of produce prices at direct and conventional retail outlets confirms that direct-to-consumer outlets have lower average prices in all seasons.

At the national level, federal policies expanded to include programs supporting local food systems. The most recent Farm Bill signed into law in 2014 expands funding to most local and regional food policies by \$501.5 million (Low et al. 2015). Notably, an updated The Farmers' Market and Local Food Promotion Program provides support for intermediated marketing channels such as farm-to-institutions and food hubs at the federal level. The 2014 Farm Bill facilitates local food data collection and sharing although with no mandatory funding, maintains the \$50-million annual minimum requirement for USDA fresh fruit and vegetable acquisitions for schools (The Fresh Fruit and Vegetable Program), and doubles the amount of mandatory funding to offset the cost of annual certification for organic farmers (The National Organic Certification Cost Share Program). Low et al. (2015) also report that 11 States have appropriated funds to increase the use of wireless EBT machines at farmers' markets.

Timmons and Wang (2010) analyze regional aspects of direct marketing sales in the U.S. using 2007 Census of Agriculture and identify farm size, location, population density and available farmland as main explanatory factors in direct marketing sales. Ultimately, this paper contributes to the understanding of a dynamics of direct-to-consumer marketing by U.S. farms using the Census of Agriculture from 1997 to 2012. We want to see if there has been a structural change in

the farm sector with respect to involvement in the direct-to-consumer marketing as this has important consequences on the well-being of local communities and has been the subject of interest among policy makers. In our empirical analysis we consider two elements of this change: entry and exit in the direct-to-consumer marketing and the extent of involvement in direct-to-consumer marketing by U.S. farms. Our findings suggest that farmers do not necessarily have a strong commitment to direct-to-consumer marketing channels. On average only 11% of the farms participating in direct marketing in 2007 continued their participation in 2012, while 54% discontinued their direct-to-consumer sales, and 25% were new participants in direct marketing. These results indicate that participation in direct-to-consumer marketing is variable over time with many farms participating in these markets based on the opportunities that they have in a given year.

II. Model

The gross value of sales directly to individual consumers for human consumption is the variable whose transition over time is to be analyzed; structural change is defined as the change in involvement in direct-to-consumer marketing by farmers. Table 1 defines intervals used in categorizing states; these are based on the distribution of direct-to-consumer sales in the data. Therefore, in any time period it is possible for a farmer to be in any one of the five specified categories.

First, we introduce a conceptual model for the transition of farms between the $k + 1$ states S_i , $i = 0, \dots, k$. The $(k + 1) \times (k + 1)$ matrix \mathbf{P}_t with elements p_{ijt} represents the probability that a farm transitions from state S_i at period $t - 1$ to S_j at period t . This probability has the following properties:

$$p_{ijt} \geq 0 \tag{1}$$

and

$$\sum_j p_{ijt} = 1. \tag{2}$$

We observe the transition of each farm between the categories of sizes (states) over time in the U.S. Census of Agriculture and trace a Census-to-Census history of each farm in terms of its transition among different categories. Anderson and Goodman (1957) show that the maximum likelihood estimator of the true transition probability matrix \mathbf{P}_t is the matrix $\hat{\mathbf{P}}_t$ with elements \hat{p}_{ijt} , where \hat{p}_{ijt} is the ratio of the numbers of farms transitioning from state S_i in period $t - 1$ to state S_j in period t :

$$\hat{p}_{ijt} = \frac{n_{ijt}}{\sum_{m=0}^4 n_{imt}} \quad (3)$$

Anderson and Goodman (1957) also derive a set of statistics to estimate (3) and test the assumption of stationarity of \mathbf{P}_t .

Transition of farms between different states can be further explained by a random utility model where farmers compare the utility that would accrue upon transitioning from state S_i to S_j .

III. Data

The USDA's Census of Agriculture has records on direct marketing sales data beginning 1978, then skipping 1987 and continuing to 1992, 1997, 2002, 2007, and 2012. Using Census data we track all 144,000 farmers in the U.S. participating in direct sales in the most recent Census. The Census questionnaire has questions on participation, value of sales and type of commodity directly marketed and it allows us to track farmers over time and construct a nationally representative panel. In the analysis, we focus on the data from the last four U.S. Censuses of Agriculture: 1997, 2002, 2007 and 2012.

We consider different types of farms using NAICS codes and farm types. Based on the NAICS classification the most prevalent farms' commodities are beef and other vegetables representing correspondingly 26.3% and 12.86% of farms involved in direct-to-consumer marketing. Hay farmers represent 6.07% of all farms, while cattle feedlots represent 4.87%, chicken 4.42%, sheep 3.81%, and hogs 3.82%, respectively of all farms. Farm types are grouped into crops, fruits and vegetables, and livestock. Figure 1 compares the number of direct-to-consumer farms across farm

types. Figure 2 presents a comparison of the share of direct-to-consumer farms across farm types. From Figure 1 and Figure 2, vegetable, fruit, and nuts farms dominate in terms of number of farms and direct sales among large farms.

Table 2 compares farms with direct-to-consumer sales across different categories of the value of direct sales. In 2007, the number of farms that sell directly to consumer increased by 6% or 7,713. Direct-to-consumer sales per farm also increased by 2% or \$209. The value of products sold directly to consumers went up by 8% or \$98,557 in 2007.

Table 3 presents corresponding growth rates in direct-to-consumer marketing. It shows that that the number of farms involved in direct marketing increases for the higher direct sales classes (with the gross sales of over \$50,000) and the value of direct-to-consumer products sold is growing at 8% for most classes.

IV. Results

Structural change is described using farmers' transition across categories of states. The choice of categories of sizes presented in Table 1 is based on the average value of direct-to-consumer sales per farm: Category one includes the number of farms with zero direct-to-consumer gross sales. Category two counts farms with less than \$500 in direct-to-consumer gross sales; category three and four include farms with \$500-\$1,500 and \$1,500-\$5,000 in direct-to-consumer sales respectively; and category five includes farms with more than \$5,000 in direct-to-consumer sales. As the choice of size categories may be important in evaluating structural change we also investigate farms' transition from one period to the next based on the share of direct-to-consumer sales in gross sales of the farm.

Table 4 presents distribution of direct-to-consumer sales across five states that are actually observed in the Census years. It is a panel of farms with direct sales either in 2007 or in 2012 or both. Farms are almost equally distributed across categories with positive direct sales (S_1 through

S_4) and 32% of farms did not have any direct-to-consumer sales in 2007. In 2012 the number of farms in state S_0 increased by 5% or 6,481.

Table 5 tracks transitions of farms across categories from 2007 to 2012 and Table 6 presents corresponding estimates of transition probabilities. Both tables confirm considerable variation in direct-to-consumer sales over time. Of the 136,820 farms participating in direct marketing, 13,384 transitioned from the less than \$500 to 0 category (S_1 to S_0), 10,870 transition from the 0 to less than \$500 category (S_0 to S_1), and only 3,589 continued to belong to the less than \$500 in direct sales.

Table 6 clarifies that farms with the smallest positive values of direct-to-consumer sales are most likely to transition to the state with no direct sales. However, the estimated probability for farms with the highest values of direct sales ($> \$5,000$) is also high, estimated at 40%. From Table 7 we see that similar tendency holds for fruits and vegetables farms which represent 28,205 or 22% of all farms. Notably, the probability of staying in the same category of direct sales is higher and for farms in the highest category it constitutes 57%. Livestock farms account for 58% of farms and they have the highest percentage of discontinuing and entry in direct marketing as compared to other farms. Generally, across all types of farms there is a very low probability (ranging from 13% to 22%) of retaining in state S_2 that combines farms with \$500-\$1,500 direct sales.

We next examine transition rates by farm size. Although the number of farms in the two categories of size is very different (14,612 farms with more than \$100,000 in total sales and 4,978 farms with more than \$350,000) they have almost identical estimates of transition probabilities. Compared with the estimates for all farms, smaller farms have higher probabilities to discontinue their participation in direct sales – 60% on average across all states versus 54% for the whole sample. And this probability is higher than 70% for transitions from the minimal direct sales state S_1 to S_0 with no direct sales.

In Table 9 we redefine the states based on the share of direct-to-consumer sales in total sales per farm. On average across all “participating” states 12% of the farms continued their participation in 2012. Farms with smaller shares of direct-to-consumer sales in total sales are most likely to transition to state with no direct sales. For example, there is a 61% chance when the share of direct sales is smaller than 5%. Similarly to Table 6, we observe significant number of farms choosing

to participate in direct-to-consumer marketing. Although different criteria are chosen to categorize states one can note similarities between Table 6 and Table 9 along with Table 7 and Table 10.

We also examine characteristics of farms that change participation and intensity in direct-to-consumer marketing. Probit models compare results for farmers that continue direct marketing as opposed to farmers who discontinue direct sales to consumers (Table 11). Farmers who continue direct marketing are more likely to have a higher proportion of direct-to-consumer to all sales, are more likely to produce fruit or vegetables and less likely to produce livestock in comparison to other crops, and are more likely to be larger farms.

V. Conclusions

This study examines participation and transition over time in direct-to-consumer marketing by U.S. farms. The findings show considerable amount of variation in direct marketing participation, particularly for the lower sales classes. On average only 11% of the farms participating in direct marketing in 2007 continued their participation in 2012, while 54% discontinued their direct-to-consumer sales, and 25% were new participants in direct marketing. We examine farm transition rates by farm size and reach the same conclusion. We also redefine the states based on the share of direct-to-consumer sales in total sales per farm and transition probabilities for all farms and farms by different types show to be also insensitive to this change. When compared by farm type (fruits and vegetables, livestock and others), we find that livestock farms have the highest percentage of discontinuing and entry in direct marketing as compared to other farms.

Our findings indicate that farmers do not necessarily have a strong commitment to direct-to-consumer marketing channels, particularly for very small farms that are also livestock farms. Direct-to-consumer marketing is variable over time with many farms participating in these markets based on the opportunities that they have in a given year. These results inform policy makers about the dynamics in direct-to-consumers marketing by U.S. farmers.

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Table 1: The Value of Direct-to-Consumer Sales, U.S. dollars

Category of Size	Category Limits
S_0	\$0
S_1	<\$500
S_2	\$500-\$1,500
S_3	\$1,500-\$5,000
S_4	>\$5,000

Figure 1: Number of Direct-to-Consumer Farms: Share across Farm Types Commodities

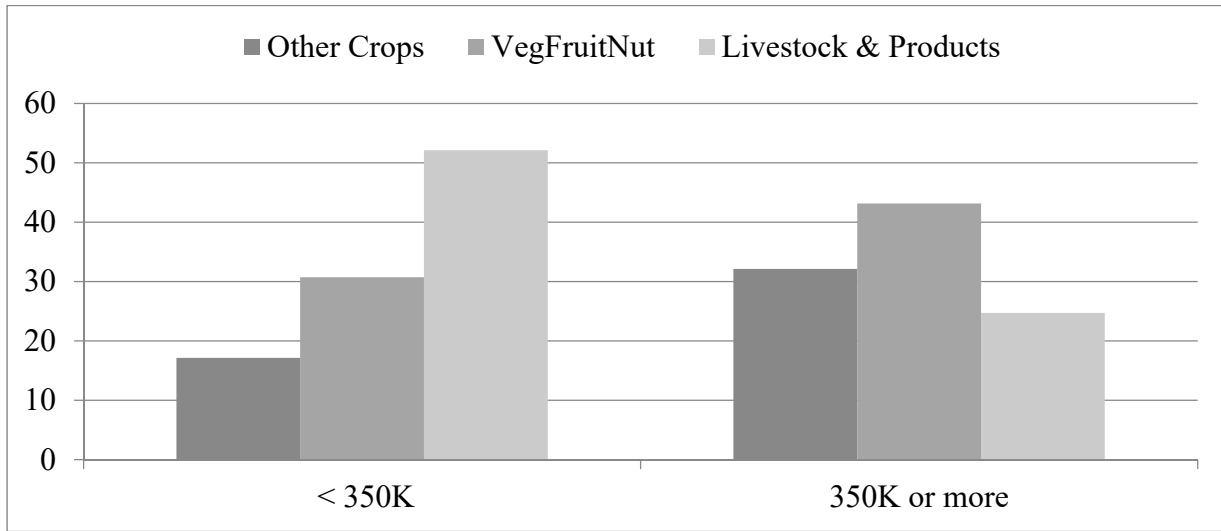


Figure 2: Direct-to-Consumer Sales: Share across Farm Types Commodities

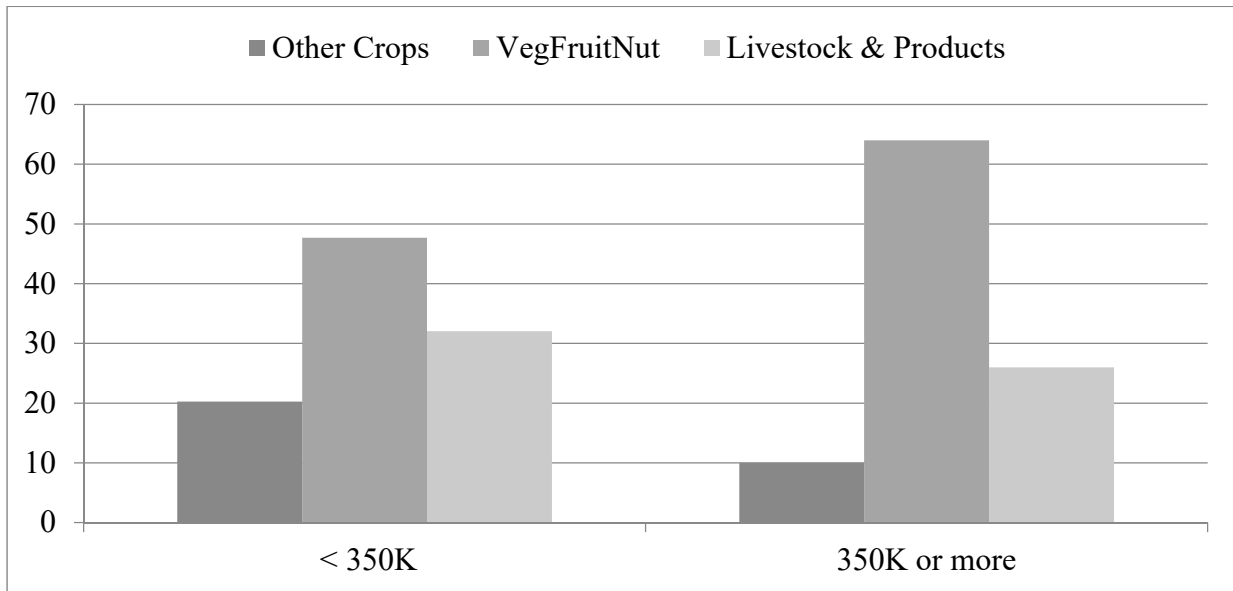


Table 2: Direct-to-Consumer Farms Performance

Value of Direct Sales categories	Number of Farms with Direct-to-Consumer Sales		Direct-to-Consumer Sales Per Farm		Value of Products Sold Direct to Consumer (\$1,000)	
	2007	2002	2007	2002	2007	2002
All farms	144,530	136,817	\$9,063	\$8,853	\$1,309,827	\$1,211,270
\$1-\$499	37,398	35,440	\$208	\$204	\$7,770	\$7,217
\$500-\$999	20,170	20,547	\$678	\$682	\$13,685	\$14,013
\$1,000-\$4,999	52,750	49,957	\$2,308	\$2,281	\$121,750	\$113,960
\$5,000-\$9,999	14,452	13,060	\$6,733	\$6,751	\$97,308	\$88,174
\$10,000-\$24,999	11,045	10,032	\$14,918	\$15,058	\$164,774	\$151,063
\$25,000-\$49,000	4,244	3,903	\$33,865	\$34,160	\$143,722	\$133,328
>\$50,000	4,471	3,878	\$170,168	\$181,412	\$760,819	\$703,515

Table 3: Direct-to-Consumer Farms Performance: Growth Rates

Value of Direct Sales categories	Number of Farms with Direct-to-Consumer Sales	Direct-to-Consumer Sales Per Farm	Value of Products Sold Direct to Consumer (\$1,000)
All farms	6%	2%	8%
\$1-\$499	6%	2%	8%
\$500-\$999	-2%	-1%	-2%
\$1,000-\$4,999	6%	1%	7%
\$5,000-\$9,999	11%	0%	10%
\$10,000-\$24,999	10%	-1%	9%
\$25,000-\$49,000	9%	-1%	8%
>\$50,000	15%	-6%	8%

Table 4: Actual Direct-to-Consumer Sales Distribution across Categories

State					
	S_0	S_1	S_2	S_3	S_4
1997					
2002					
2007	32%	16%	17%	19%	17%
2012	37%	14%	14%	18%	18%
1997-2012 Average					

Table 5: Farm Transitions for Base Periods

2007-2012						
Category of Size	S_0	S_1	S_2	S_3	S_4	2007 Total
S_0		10,870	10,394	11,816	8,622	41,702
S_1	13,384	3,589	2,215	1,444	658	21,290
S_2	12,843	1,821	3,137	2,779	1,087	21,667
S_3	13,107	1,050	2,137	4,848	3,068	24,210
S_4	8,849	571	868	2,145	9,518	21,951
2012 Total	48,183	17,901	18,751	23,032	22,953	130,820

Table 6: Percent of Farms Transitioning

2007-2012					
Category of Size	S_0	S_1	S_2	S_3	S_4
S_0		26%	25%	28%	21%
S_1	63%	17%	10%	7%	3%
S_2	59%	8%	14%	13%	5%
S_3	54%	4%	9%	20%	13%
S_4	40%	3%	4%	10%	43%

Table 7: Percent of Farms Transitioning by Farm Types

2007-2012					
Fruits and Vegetables Farms (n = 28,205)					
Category of Size	S₀	S₁	S₂	S₃	S₄
S₀		24%	21%	24%	31%
S₁	49%	25%	13%	8%	5%
S₂	41%	13%	22%	16%	8%
S₃	34%	8%	13%	27%	18%
S₄	24%	3%	5%	10%	57%
Livestock Farms (n = 75,951)					
Category of Size	S₀	S₁	S₂	S₃	S₄
S₀		27%	26%	29%	18%
S₁	67%	14%	10%	6%	2%
S₂	65%	7%	13%	12%	4%
S₃	59%	4%	8%	18%	10%
S₄	55%	2%	3%	10%	29%
Other Farms (n = 26,664)					
Category of Size	S₀	S₁	S₂	S₃	S₄
S₀		26%	24%	29%	21%
S₁	63%	16%	9%	8%	3%
S₂	60%	7%	13%	14%	6%
S₃	56%	3%	7%	19%	15%
S₄	39%	2%	3%	8%	48%

Table 8: Percent of Farms Transitioning by Farm Sizes

2007-2012					
Farms with Total Sales > \$100,000 (<i>n</i> = 14,612)					
Category of Size	<i>S</i>₀	<i>S</i>₁	<i>S</i>₂	<i>S</i>₃	<i>S</i>₄
<i>S</i>₀		11%	15%	28%	46%
<i>S</i>₁	74%	8%	6%	4%	7%
<i>S</i>₂	67%	4%	9%	9%	11%
<i>S</i>₃	63%	2%	4%	12%	18%
<i>S</i>₄	37%	1%	2%	5%	55%
Farms with Total Sales > \$350,000 (<i>n</i> = 4,978)					
Category of Size	<i>S</i>₀	<i>S</i>₁	<i>S</i>₂	<i>S</i>₃	<i>S</i>₄
<i>S</i>₀		9%	12%	26%	53%
<i>S</i>₁	77%	8%	6%	4%	5%
<i>S</i>₂	74%	3%	6%	6%	11%
<i>S</i>₃	70%	0%	3%	10%	17%
<i>S</i>₄	41%	0%	1%	4%	54%

Table 9: Percent of Farms Transitioning by the Share of Direct Sales in Total Sales

2007-2012					
Share of Direct Sales in Total Sales	0%	<5%	5%-25%	25%-75%	>75%
0%		31%	30%	20%	19%
<5%	61%	19%	12%	5%	4%
5%-25%	51%	10%	19%	12%	7%
25%-75%	46%	5%	15%	20%	13%
>75%	46%	4%	12%	14%	24%

Table 10: Percent of Farms Transitioning by Farm Types and Shares of Direct Sales in Total Sales

2007-2012					
Fruits and Vegetables Farms (n = 26,490)					
Category of Size	0%	<5%	5%-25%	25%-75%	>75%
0%		28%	33%	17%	22%
<5%	45%	20%	19%	8%	8%
5%-25%	33%	13%	27%	14%	13%
25%-75%	24%	9%	20%	27%	20%
>75%	26%	7%	19%	16%	32%
Livestock Farms (n = 68,205)					
Category of Size	0%	<5%	5%-25%	25%-75%	>75%
0%		28%	29%	22%	22%
<5%	67%	18%	9%	4%	3%
5%-25%	59%	7%	16%	11%	7%
25%-75%	54%	4%	12%	17%	12%
>75%	56%	3%	8%	12%	21%
Other Farms (n = 25,155)					
Category of Size	0%	<5%	5%-25%	25%-75%	>75%
0%		41%	30%	17%	12%
<5%	63%	21%	10%	3%	2%
5%-25%	52%	11%	20%	12%	4%
25%-75%	41%	6%	19%	25%	10%
>75%	29%	4%	14%	26%	26%

Table 11: Probit Models for Exits and Entries in Direct Marketing

	2007 Positive to 2012 Zero Direct Sales	New Participants vs Continuing Participants
Direct-to-Total Sales Proportion	-	-
Direct Sales	-	-
Veg/Fruit Farm	-	-
Livestock Farm	+	+
Small Farm	+	-
Beginning Farmer	0	+

Note: results are not cleared yet.