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## **Abstract**

This paper investigates the relationships between country of origin labeling (COOL) issues and consumers concern about safety and health towards using of foreign produce. Results show that those who were married, self employed, had higher incomes, or possessed more education were more likely to support COOL. A consumer survey showed that about 84% of respondents overall, and more specifically, about 84% of female and 83% of male respondents would like markets to provide information about country of origin of fresh produce. The result also shows that about 73% of respondents regularly read food advertisements in newspapers and grocery brochures.

# **Country of Origin Labeling of Fresh Produce: A Consumer Preference Analysis**

## **Introduction**

The concept of country of origin labeling information is not new to consumers of produce. It has been widely used in various countries to protect their own products from international competition. The war on terrorism has given increased reasons for concerns about food safety and security, which can be addressed, in part, through country of origin labeling (COOL). Consumer information regarding country of origin is important whenever specific health and safety problems arise that may be linked to imported foods. Discussion of consumers' right to know has been discussed in several studies about country of origin of produce (Food Marketing Institute, 2002); moreover the 2002 Farm Bill mandates that COOL information be provided at the retail level, by September 30, 2004, for seafood (wild-caught and farmed-raised), and by September 30, 2006, for beef, pork, lamb, fresh and frozen fruits and vegetables and peanuts (AMS, USDA, 2002). Additionally, those United States producers which compete with importers have long advocated COOL mandates at the retail level to better promote domestic food sales.

At the same time, consumers have been developing increasing knowledge concerning the quality, safety and production attributes of their food (Caswell, 1998). Production attributes including country of origin are considered to be important characteristics (Darby and Karni, 1973; Caswell and Mojduszka, 1996). Several consumer surveys indicate that a high percentage of respondents strongly advocated the COOL requirements (Umberger and Feuz et.al, 2003).

Some of the arguments supporting the need for COOL suggest that produce from outside the United States may not be safe because of the threat of agroterrorism. According to a 1996 national study conducted by Charlton Research Company of San Francisco for Desert Grape Growers League of California, 74 percent of those surveyed support COOL for fresh produce (Charlton Research Company, 1996). When asked why country of origin matters, 41 percent expressed concern about foreign growing methods or safety/sanitation standards.

In 1992, *The Packer's* nationwide consumer survey results indicated that 77 percent of consumers agreed, at least to some degree, that the growing region of all produce items should be identified at the retail level. Overall, the number of consumers concerned about the country of origin of produce has been increasing and is up 24% since 1991 (*The Packer*, 1996). Again, in 2002, the Packer survey showed that 86% of respondents were favorable towards country of origin labeling (*The Packer*, 2002). A 1997 survey of Florida consumers, conducted by researchers at the University of South Florida, showed that 96 percent favored COOL on fresh fruits and vegetables (USF, 1996).

Competition among firms may also give consumers an opportunity to receive more information about competing products (Ippolito and Mathios, 1990). Transparency of labeling has become a widely acceptable phenomenon, one which is extremely useful to consumers as they decide which product to buy.

On the other hand, food retailers, wholesalers and processors, as well as those countries which are major United States trading partners, such as Australia, Canada, Mexico and New Zealand, have strongly opposed COOL. Trade partners, particularly,

see these mandates as protectionist trade barriers. The food industry, including many producers, is also concerned about the cost to implement a COOL mandate, which ultimately will be borne by consumers. In the face of this opposition, this study focuses specifically on New Jersey consumers to consider their preferences about COOL.

The main objective of this study is to survey and quantify consumers' preferences regarding COOL in the field of fresh produce, an area which particularly produces concerns about agroterrorism. More specifically, this paper examines the relationships between attitudes towards COOL and consumer concern about safety and health with regard to use of foreign produce.

## **Methodology**

The logit model was selected as the regression model for the analysis required by this paper, because of its asymptotic characteristic constraint in which the predicted probabilities range from zero to one. The logit model is commonly used in settings where the dependent variable is binary. Because the data sources provided individual rather than aggregate observations, the common estimation method of choice was the maximum likelihood method (MLE) (Gujarati, 1992). Among the beneficial characteristics of MLE are that the parameter estimates are consistent and efficient asymptotically (Pindyck and Rubinfeld, 1991). Given that the objective was to decompose the effects of explanatory demographic variables, the final model specifications were more dependent on the significance of the parameter estimates than the overall predictive power of the models.

The empirical model assumes that the probability of observing the dependent variable (for instance, respondents who would like markets to provide information about

the country of origin of Fresh Produce),  $P_i$ , is contingent on a vector of independent variables ( $X_{ij}$ ) associated with consumer  $i$  and variable  $j$ , and a vector of unknown parameters  $b$ . The likelihood of observing the dependent variable was tested as a function of variables which included socio-demographic and consumption characteristics.

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

Where:

$P_i$  = the probability of who would like markets to provide information about the Country of Origin of Fresh Produce depend upon a vector of independent variables  $X_{ij}$ s

$F(Z_i)$  = represents the value of the standard logistic density function associated with each possible value of the underlying index  $Z_i$ .

$Z_i$  = the underlying index number or  $\alpha + \beta X_{ij}$

And  $\beta X_{ij}$  is a linear combination of independent variables so that:

$$Z_i = \log [P_i / (1 - P_i)] = \beta_{i0} + \beta_{i1} X_{i1} + \beta_{i2} X_{i2} + \dots + \beta_{in} X_{in} + \varepsilon_i$$

Where:

$i$  = 1, 2, . . . , n are observations

$Z_i$  = the unobserved index level or the log odds of choice for the  $i^{\text{th}}$  observation

$X_{in}$  = the  $n^{\text{th}}$  explanatory variable for the  $i^{\text{th}}$  observation

$\beta$  = the parameters to be estimated

$\varepsilon$  = the error or disturbance term

The dependent variable  $Z_i$  in the above equation is the logarithm of the probability that a particular choice will be made. The parameter estimates do not directly represent the effect of the independent variables. To obtain the estimators for continuous explanatory variables in the logit model, the changes in probability that  $Y_i = 1(P_i)$  brought about by a change in the independent variable,  $X_{ij}$  is given by

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

For qualitative discrete variables such as the explanatory variables used in this study,  $\partial P_i / \partial X_{ij}$  does not exist. Probability changes are then determined by:

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

The following model was developed to estimate characteristics of respondents who would like markets to provide information about the Country of Origin of Fresh Produce.

The model was described as:

$$\begin{aligned} \text{COOL} = & \beta_0 + \beta_1 \text{BROCHURE} + \beta_2 \text{ADVTSPCEL} + \beta_3 \text{SPENDFAMRKT} \\ & + \beta_4 \text{SPENDPRODUCE} + \beta_5 \text{URBAN} + \beta_6 \text{YEARSINNJ} \\ & + \beta_7 \text{FAMILYSIZE} + \beta_8 \text{BELOWAGE17} + \beta_9 \text{GENDER} \\ & + \beta_{10} \text{AGE51TO65} + \beta_{11} \text{DEGREE} + \beta_{12} \text{HOMEMAKER} \\ & + \beta_{13} \text{ETHNIC} + \beta_{14} \text{INCOME100K} + \beta_{15} \text{MARRIED} \end{aligned}$$

Where:

- COOL = 1 if the respondent's would like markets to provide information about the Country of Origin of Fresh Produce and 0 otherwise
- BROCHURE = 1 if the respondent regularly reads food advertisements in Newspaper/grocery-brochures and 0 otherwise.
- ADVTSPCEL = 1 if the respondent regularly shop at more than one food store in order to purchase advertised specials and 0 otherwise.
- SPENDFAMRKT = respondent spends (average) at farmers' market per visit
- SPENDPRODUCE = respondent spends (average) on produce in a month.
- URBAN = 1 if the respondent lives in urban area and 0 otherwise.
- YEARSINNJ = respondent lives in New Jersey (average years).
- FAMILYSIZE = respondent's family size.
- BELOWAGE17 = number of person's (average) below age 17 in the house.
- GENDER = 1 if the respondent is a female and 0 if the respondent is a male.



AGE51TO65	= 1 if the respondent's Age between 51 to 65 and 0 otherwise.
DEGREE	= 1 if the respondent's Education 2/4 year college degree and 0 otherwise.
HOMEMAKER	= 1 if the respondent is Homemaker and 0 otherwise.
ETHNIC	= 1 if the respondent's ethnicity is white and 0 otherwise.
INCOME100K	= 1 if the respondent's Annual Average income is \$100,000 or more and 0 otherwise.
MARRIED	= 1 if the respondent is married and 0 otherwise.

## **Data**

A survey was prepared in January 2004 at Rutgers University to collect data on preference for Country of Origin Labeling to New Jersey residents. The survey also included questions to allow determination of demographic characteristics of each consumer respondent. The survey was developed with input from the marketing experts, Rutgers Cooperative Research and Extension specialists and experts from the State of New Jersey.

One thousand households were randomly selected in New Jersey. Each survey packet included the questionnaire, a cover letter explaining the purpose and importance of the survey, a postage-paid return envelope, and a dollar bill as a small incentive. Of the one thousand surveys, 321 usable surveys were returned.

## **Consumer Preferences towards Country of Origin Labeling of Fresh Produce**

### **Descriptive Statistics**

Simple descriptive statistics allow correlation of consumer opinions regarding the importance to them of COOL labeling to their demographic features. According to the

consumers survey results, about 84% of respondents overall would like to have country of origin labeling. In general, households of 6 or less were more predisposed towards COOL. However, there was some divergence among the various levels of household inhabitants. Among those with a household size of 3 people, 88% of respondents favored country of origin labeling of fresh produce, whereas, among those with a household size of 5, 86% of respondents favored this labeling. For households of only one or two individuals, 85% of each category were, would like markets to provide information about the country of origin of fresh produce, whereas among those with 4 and 6 in the household, 80% of each favored COOL labeling (Table 1).

As can be seen from Table 2, female and male respondents showed nearly equal overall percentages of those (84% and 83%) positive towards COOL. Table 3 shows that, among those in the age group of 21-35, 74% of respondents were wished to have information about the country of origin of fresh produce, whereas, among 36-50 and 51-65 age group categories, 85% of the respondents were favorable to COOL labeling for fresh produce. Among those in the 65 and above age group category, 82% of respondents were positive towards COOL.

In the case of education, the results, shown on Table 4, indicate that generally, as education level increases, so too does preference for country of origin labeling of fresh produce. Among those with up to a high school education, 79% of respondents were favorable, whereas, among those who hold a 2 or 4 year college degree, 87% of respondents were preferred towards COOL. Among those with a post-graduate degree, there was a slight decrease in percentage of respondents—85%--who were favorable

towards COOL. As noted, overall, respondents with greater education were more inclined to favor country of origin labeling information.

Table 5 shows that, in the case of occupation, among those who are self employed, 95% of respondents favored COOL, whereas, among both those in the retired and others groups, about 82% of respondents were positive towards country of origin labeling. Among those employed by others, 81% of respondents were favorable to COOL for fresh produce. Of those in the homemakers group, 79% of respondents favored COOL.

In the case of income, as can be seen from Table 6, for households earning up to \$20,000, 63% of them responded positively towards country of origin labeling. Among households in the \$20,000-40,000 income category, 83% of respondents favored COOL, whereas, in the \$40,000-60,000 income category, about 91% of respondents were positive towards country of origin labeling. In the \$60,000-80,000 income category, 79% of respondents would like COOL, whereas, 86% of respondents in the \$80,000-100,000 income bracket were favorable to COOL. In the above \$100,000 household income category, 87% of respondents favored COOL.

Table 7 show results by marital status. Among both those in the “separated” and “other” groups, 100% of respondents were positive towards COOL, whereas of those whose spouses had died, 90% of respondents favored COOL. Yet, of those who were divorced, only 68% favored COOL. Among those who identified themselves as singles, 69% of respondents would like to have country of origin labeling information. Of the married respondents, 86% were positive towards COOL.

## **Logit Model Analysis**

Based on a consumer's demographic and behavioral characteristics, a logit model allows prediction of the likelihood that a respondent would like markets to provide information about the country of origin fresh produce. Table 8 summarizes explanatory variables derived from the survey results, showing frequency of a Yes or No response, as well as mean and standard deviation values. These explanatory variables were used in the logit regression model. The results indicate that about 73% of respondents regularly read food advertisements in news papers and grocery brochures. About 46% of respondents regularly shop at more than one food store to purchase advertised specials. Table 8 also shows that, on average, each respondent spent \$20.50 at farmers market per visit and \$70.17 on fresh produce per month. About 12% of respondents live in an urban environment. On average, the respondents have lived in New Jersey for 37 years. There was fewer than one person below age 17 in each respondent household. About 37% of respondents were male and about 26% respondents were between 51 and 65 years of age. About 38% of respondents had a 2/4 year college degree, and about 12% of respondents were homemakers. Table 8 also shows that about 81% of respondents were Caucasians and 27% of respondents had an average annual income of more than \$100,000. About 64% of respondents were married.

Tables 9 and 10 present the results from applied logit modeling. As noted, the logit model predicts the likelihood whether a consumer would like markets to provide information about the country of origin of fresh produce, given his or her demographic and behavioral characteristics. Among sixteen demographic variables, seven proved to be significant. Of the seven variables, three were at a 10 percent significance level, one was

at a 5 percent level and three were at the one percent level of significance. Of the total of 321 observations used in this model, 267 (83 percent) of the survey respondents indicated that they would like markets to provide information about the country of origin of fresh produce. Only 54 (17 percent) indicated they did not wish to have COOL information on produce. The model correctly predicted the state of independent variable in 86 percent of the total observations. The chi-square statistics rejected the null hypothesis that the explanatory variables as a set were insignificant in explaining variations in the dependent variable at 0.0072 levels and the McFadden's  $R^2$  was 0.21.

Among the independent variables, those which correlated significantly with desire for COOL were the following respondent characteristics: spending at farmers markets, spending of additional amounts on produce to be able to purchase fresh produce, residence in an urban area, family size, longer residence in New Jersey, number of persons below age 17 in a household, gender, respondent's age being between 51 to 65, completion of a 2/4 year college degree, home maker, ethnicity of respondents, and annual average income of \$100,000 or more and marital status.

Those who spent at farmers market to be able to purchase Jersey Fresh products were less than 1% less likely to supports country of origin label information. This may be because those who bought produce regularly at local farmers markets may assume everything is from local farms.

Those who spent more (for each additional dollar) on produce in a month were 1% more likely to favor COOL. Regarding location, those who live in an urban area were 12% less likely to desire country of origin information for fresh produce. With regards to family size, the results indicate that those who have large family size (for each

additional member) were 1% less likely to think about country of origin information of fresh produce. Families with more children below 17 years of age were less than 1% more likely to look for country of origin labeling of fresh produce.

With respect to education level, those with a 2/4 year college degree were 5% more likely to desire information about the country of origin of fresh produce.

In the case of occupation, homemakers were 11% more likely to support country of origin labeling information of fresh produce. This may be mainly because of the time they spent in preparing meal, buying groceries and concern with safety of produce.

## **Conclusions**

The concept of country of origin labeling information is not new to consumers of produce. It has been widely used in various countries to protect their own products from international competition. According to the study, approximately the same percentages of male and female respondents favored produce information about the country of origin. Among those in the age group of 36-65, those who have higher educational levels, who are self employed, respondents with high income and those who are married showed more desire for country of origin labeling information. The result also reflects that about 73% of respondents regularly read food advertisements in news papers and grocery brochures.

According to the result of logit model analysis, homemakers, or those who have a 2/4 years college education, were more likely to desire country of origin information. Respondents who were residing in an urban area were 12% less likely to desire country of origin information.

Overall, a large percent (84%) of consumers would like markets to provide country of origin of fresh produce. This may flow from consumer concerns about safety and their preference for buying more local produce. It may show a need to have producers, wholesalers and retailers disclose more produce details and facts. Additional information is required to determine the labeling issues and cost involvement.

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**Table 1: Consumers Preferences towards Country of Origin Labeling of Fresh Produce by Household Size**

Household Size	Country of Origin of Fresh Produce					
	Yes		No		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
1	44	85%	8	15%	52	100%
2	85	85%	15	15%	100	100%
3	53	88%	7	12%	60	100%
4	47	80%	12	20%	59	100%
5	18	86%	3	14%	21	100%
6	12	80%	3	20%	15	100%
7+	1	50%	1	50%	2	100%
<b>Total</b>	<b>260</b>	<b>84%</b>	<b>49</b>	<b>16%</b>	<b>309</b>	<b>100%</b>

**Table 2: Consumers Preferences towards Country of Origin Labeling of Fresh Produce by Sex**

Sex	Country of Origin of Fresh Produce					
	Yes		No		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Male	96	83%	20	17%	116	100%
Female	165	84%	31	16%	196	100%
<b>Total</b>	<b>261</b>	<b>84%</b>	<b>51</b>	<b>16%</b>	<b>312</b>	<b>100%</b>

**Table 3: Consumers Preferences towards Country of Origin Labeling of Fresh Produce by Age**

Age Distribution	Country of Origin of Fresh Produce					
	Yes		No		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
0-20	1	100%	0	0%	1	100%
21-35	25	74%	9	26%	34	100%
36-50	103	85%	18	15%	121	100%
51-65	71	85%	13	15%	84	100%
65 and Above	59	82%	13	18%	72	100%
<b>Total</b>	<b>259</b>	<b>83%</b>	<b>53</b>	<b>17%</b>	<b>312</b>	<b>100%</b>

**Table 4: Consumers Preferences towards Country of Origin Labeling of Fresh Produce by Education**

Educational Levels	Country of Origin of Fresh Produce					
	Yes		No		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
No Formal Schooling	1	50%	1	50%	2	100%
Up to High School	100	79%	27	21%	127	100%
2/4 College Degree	105	87%	16	13%	121	100%
Post Graduate	50	85%	9	15%	59	100%
<b>Total</b>	<b>256</b>	<b>83%</b>	<b>53</b>	<b>17%</b>	<b>309</b>	<b>100%</b>

**Table 5: Consumers Preferences towards Country of Origin Labeling of Fresh Produce by Occupation**

Occupation	Country of Origin of Fresh Produce					
	Yes		No		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Retired	60	82%	13	18%	73	100%
Self-employed	37	95%	2	5%	39	100%
Employed by others	121	81%	28	19%	149	100%
Homemaker	30	79%	8	21%	38	100%
Others	9	82%	2	18%	11	100%
<b>Total</b>	<b>257</b>	<b>83%</b>	<b>53</b>	<b>17%</b>	<b>310</b>	<b>100%</b>

**Table 6: Consumers Preferences towards Country of Origin Labeling of Fresh Produce by Income**

Income (dollars)	Country of Origin of Fresh Produce					
	Yes		No		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Up to 20,000	19	63%	11	37%	30	100%
20,000-39,000	39	83%	8	17%	47	100%
40,000-59,000	42	91%	4	9%	46	100%
60,000-79,000	30	79%	8	21%	38	100%
80,000-99,000	25	86%	4	14%	29	100%
100,000-More	76	87%	11	13%	87	100%
<b>Total</b>	<b>231</b>	<b>83%</b>	<b>46</b>	<b>17%</b>	<b>277</b>	<b>100%</b>

**Table 7: Consumers Preferences towards Country of Origin Labeling of Fresh Produce by Marital Status**

Marital Status	Country of Origin of Fresh Produce					
	Yes		No		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Single	25	69%	11	31%	36	100%
Separate	3	100%	0	0%	3	100%
Widower (d)	27	90%	3	10%	30	100%
Divorced	19	68%	9	32%	28	100%
Married	177	86%	28	14%	205	100%
Other	8	100%	0	0%	8	100%
<b>Total</b>	<b>259</b>	<b>84%</b>	<b>51</b>	<b>16%</b>	<b>310</b>	<b>100%</b>

**Table 8: Descriptive Tabulation of Explanatory Variables**

Variable	Frequency	Percent/ Mean	Std. Dev
Those who regularly read food advertisements in newspaper/ grocery-brochures			
BROCHURE	YES	230	72.56
	NO	87	27.44
Those who regularly shop at more than one food store in order to purchase advertised specials			
ADVTSPCEL	YES	147	46.23
	NO	171	53.77
Those who spend (average in dollars) at farmers' market per visit			
SPENDFAMRKT		214	20.50
Those who spend (average) on produce in a month			
SPENDPRODUCE		238	70.17
Those who live in urban area			
URBAN	YES	38	11.84
	NO	283	88.16

Those who live in New Jersey (average years)				
YEARSINNJ		312	37.00	21.77
Number of persons in your household (average size)				
FAMILYSIZE		309	2.85	1.43
Number of persons below age 17 in your household				
BELOWAGE17		304	0.66	1.04
Gender by Male/Female				
GENDER	Male	116	37.18	0.48
	Female	196	62.82	0.48
Age between 51 and 65				
AGE51TO65	YES	84	26.17	0.44
	NO	237	73.83	0.44
Education with 2/4-year college degree				
DEGREE	DEGREE	121	37.69	0.49
	OTHERS	200	62.31	0.49
Current Occupation				
HOMEMAKER	HOMEMAKER	38	11.84	0.32
	OTHERS	283	88.16	0.32
Ethnicity				
ETHNIC	WHITE	259	80.69	0.40
	OTHERS	62	19.31	0.40
Annual Average income \$100,000 or more				
INCOME100K	YES	87	27.10	0.45
	NO	234	72.90	0.45
Marital Status				
MARRIED	MARRIED	205	63.86	0.48
	OTHERS	116	36.14	0.48

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**Table 9: Logit Modeling – Consumers Preferences towards Country of Origin Labeling for Fresh Produce**

	Parameter Estimate	Standard Error	Change in Probabilities
INTERCEPT***	3.2027	1.1160	
BROCHUR	0.7680	0.6125	
ADVTSPCEL	-0.3330	0.5404	
SPENDFAMRKT***	-0.0444	0.0171	-0.0032
SPENDPRODUCE**	0.0135	0.0063	0.0096
URBAN*	-1.1765	0.7021	-0.1236
YEARSINNJ	0.0016	0.0126	
FAMILYSIZE***	-0.8716	0.2555	-0.0096
BELOWAGE17**	0.8494	0.3452	0.0021
GENDER	-0.0297	0.4945	
AGE51TO65	0.8898	0.6440	
DEGREE*	0.8139	0.4969	0.0544
HOMEMAKER*	3.6707	2.2074	0.1115
ETHNIC	-0.5776	0.6780	
INCOME100K	-0.0258	0.5557	
MARRIED	0.5472	0.5404	

\*\*\* Significant at 1%  
 \*\* Significant at 5%  
 \* Significant at 10%

**Table 10: Predictive Accuracy of Logit Model**

		<i>Predicted</i>		
		0	1	Correct
<i>Actual</i>	0	3	24	3/27
	1	2	152	152/154

Number of correct predictions: 155  
 Percentage of correct predictions: 85.6 percent