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ATTITUDES OF URBAN FEMALE CONSUMERS TOWARD FOOD PRODUCTION PRACTICES IN THE REPUBLIC OF KOREA

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Abstract

Socioeconomic, demographic, and location characteristics as well as opinions and views of South Korean urban females were analyzed to understand how these characteristics influence preferences for foods produced through different production practices. The generalized ordinal logistic model results show that education of the respondent and household location have significant influence on preferences. Age and income influence preferences for selected production techniques and respondents' opinions on the use of pesticides and importance of other food attributes weaken preferences for food produced by conventional practices, but increase preferences for food produced using unconventional practices.

Keywords: food production technology, survey, education, age, homemaker, consumer profile

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Disclaimer:
The content of the paper does not represent any views of the Rural Development Administration of the Republic of Korea, but is a result of a research inquiry of the authors.

Introduction

Sustainable food production practices are gaining popularity worldwide because of environmental concerns and decreases in productivity associated with conventional food production practices, which rely heavily on synthetic chemical inputs [REGANOLD et al. 1990; RAINS et al. 2011]. Reduction in productivity, which is mainly due to soil degradation and loss of biodiversity, is driving governments across the globe to adopt policies to increase agricultural productivity and increase food supply self-sufficiency. Adoption of sustainable practices is one of the ways to minimize the damages inflicted by conventional agriculture and is also an effective strategy to assure a self-sufficient food supply [TILMAN et al. 2002; TAKÁCS-GYÖRGY et al. 2013].

Since the 1960s, the Republic of Korea has transformed from an agrarian-based society to an industrialized economy. However, the goal of attaining self-sufficiency in food production has always been a priority for South Korea [KIHL and PARK 1981]. Since available land is limited and conventional food production practices are responsible for the decreased productivity of the land, the next best option for the country is to adopt sustainable production practices.

According to a new UN report, low input farming projects that do not rely on chemical fertilizers and pesticides have been very successful in significantly increasing food production in South East Asia, Africa, and South America [LEWITT 2011]. Sustainable methods include non-conventional practices like organic farming, precision farming, and reduction in synthetic chemical input use, all aimed at increasing land productivity and regaining environmental health [RAINS et al. 2011].

Adoption of sustainable food production practices by farmers is the most important step in the implementation of such policies. Society can influence adoption processes as well. A farmer who engages in sustainable farming practices is more influenced by his social standing [CUTFORTH et al. 2001] than actual yields or quality of produce obtained by such practices. The yields, which may initially be lower than those obtained using conventional practices, may affect his social standing, because 'better yields' are obtained by 'better farmers'. The environmental or societal benefits of his sustainable practices may not be involved in determining his social standing [NORMAN et al. 1997]. A clear understanding of the benefits of sustainable practices will increase the support for sustainable farms, which in turn can have a tremendous cultural influence on society. People who are aware of the need for a healthy environment can influence policy makers, educators, and farmers in implementing sustainable food production practices [FAZIO et al. 2007]. Therefore, studies on societal effects are as important as studies on the technical aspects of these practices [REED 2004].

If consumers demand sustainably grown foods, then farmers and researchers will focus on stainable food production practices [KLINKENBORG 1995], because consumer needs determine the success of a production chain. Perceptions of food quality have changed greatly and can be decisive in the purchasing process [LINNEMANN et al. 2006; WISMER 2014]. Government policy makers can create awareness among consumers regarding the benefits of sustainable practices. The demand for foods produced using such practices may therefore increase, eventually inducing their widespread adoption. Providing information about foods on product labels is known to influence consumers' knowledge and purchasing patterns [CASWELL and MOJDUSZKA 1996]. Consumer needs and wishes are also shaped by individual preferences and different socio-economic factors. Information gathered from consumers is essential to integrate consumer food product development preferences in an effective and timely manner [JONGEN et al. 1999].

This paper examines how the attitudes of Korean consumers toward food produced by non-conventional methods and conventional methods change with their socio-economic and demographic characteristics as well as their opinions toward specific food production practices and food characteristics. The results of this study will also help create profiles of consumers who will be willing to buy foods produced through these food production practices.

Materials and Methods

Data

The study uses data collected through a survey conducted in seven urban centers of the Republic of Korea in September 2007. The survey, implemented by a commercial market research company, involved 1100 women responsible for food shopping and meal preparation. The survey instrument was prepared by a team of Korean and American researchers. Respondents provided socioeconomic and demographic information, shared opinions and views regarding certain food attributes, new agricultural and food technologies, and expressed their willingness/unwillingness to buy genetically modified (GM) foods having certain attributes.

Four equations were estimated and the empirical estimations use 850 observations after the deletion of incomplete responses. Table 1 shows descriptive statistics and variable definitions.

The dependent variable in all four equations is categorical with seven ordered responses (Likert-scale) ranging from a value of "1" that represents "strongly disagree" to a value of "7" that indicates "strongly agree" with a statement. The four statements begin with the words "I prefer to eat foods produced…" followed by: 1) using conventional production practices (Conven), 2) using modified practices with need-based pesticide applications (Modified), 3) using nonconventional practices without synthetic pesticides (Nonconpestfree), and 4) using nonconventional methods with latest technologies (Nonconlatest). The explanatory variables include socioeconomic and demographic characteristics such as household income, age, education, occupation, presence of children, and location in addition to variables constructed from respondents' opinions and views.

Several earlier studies [for example, ROBERTS 1996; CARRIGAN and ATTALLA 2001; MAIGNAN and FERREL 2001] have concluded that sustainable foods are mainly purchased by specific consumer segments. They find that consumers, in this segment (referred to as "ethical consumers") are usually middle aged, well educated, have a prestigious job, high income, and are well informed. So age, education, occupation, and income are proven to have some influence on consumers with regard to the purchase of sustainably produced foods. This study includes occupation as four dummy variables that represent white collar jobs, blue collar jobs, homemakers (chosen as a reference job type), and jobs classified as "others." Location variables are West, East, and Seoul, the capital. West includes cities of Daejeon, Incheon, and Kwangju and East includes Busan, Ulsan, and Daegu. Since Seoul is the largest urban area with more than 20 % of the total population of South Korea residing there, it is selected as the reference location. Consumers from different locations may have varied opinions regarding the different types of food production practices. Presence of children in the household may influence a respondent's view regarding a particular food production practice, since the concern about the safety of foods might increase when there are children in the household.

Some previous studies maintain that demographic features alone are insufficient to explain the behavioral pattern of ethical consumers [ROBERTS 1995; DIAMANTOPOULOS et al. 2003]. According to ROBERTS [1996], attitudes and behavioral and personality characteristics are also important to identify those consumers who will be willing to try sustainable foods. Another study by ROBINSON and SMITH [2002] also emphasize the significance of attitudes and beliefs in explaining the purchase intentions toward sustainable foods. Following the previous research, this study employs several variables constructed from the opinions and views of consumers.

Table 1. Descriptive statistics of variables included in the empirical equation.

Variable name	Description and units of measurement	Mean or share[a]	Std dev.
Dependent variable (categorical variable with seven response options)			
	I prefer to eat food produced using:		
Conven[a]	Conventional production practices	2.2488	0.0517
Modified[a]	Modified practices with need-based pesticide application	3.0595	0.0623
Nonconpestfree[a]	Nonconventional practices without synthetic pesticides	5.4821	0.0556
Nonconlatest[a]	Nonconventional practices with latest technologies	5.4476	0.0548
Independent variables			
Socio-economic factors			
Income	Monthly household income in US$	3640.7	39.8207
Educ	Respondent's education in years	13.0607	0.0742
White	= 1 if the respondent has a white collar job	0.2714	0.0154
Blue	= 1 if the respondent has a blue collar job	0.275	0.0154
Homemaker[b]	= 1 if the respondent is a homemaker	0.4201	0.4939
Others	= 1 if the respondent's job is not included in any of the above categories and 0 otherwise	0.0345	0.0063
Demographic variables			
Age	Age in years	41.2881	0.2855
Child	= 1 if the household has children, 0 otherwise	.6595	0.0164
Household location			
East	=1 household located in Daegu, Ulsan, or Busan, 0 otherwise	0.2429	0.0148
West	=1 household located in Incheon, Daejeon or Kwangju, 0 otherwise	0.2643	0.0152
Seoul[b]	=1 household located in Seoul, 0 otherwise	0.4829	0.5000
Opinion variables			
	New agricultural and food technologies should focus on:		
Techfert[a]	Reducing the amount of fertilizers used in production	5.6024	0.0442
Techpest[a]	Reducing the amount of pesticides used	5.7083	0.0428
Secfdsupp[a]	Assuring the security of national food supply	5.5893	0.0392
	How important to you is it that food:		
Morevit[c]	Have vitamins	5.2381	0.0509
Pestfree[c]	Be pesticide free	5.6131	0.0439
Org[c]	Be organic	5.36310	0.0468
	I would buy GM foods if they		
Gmhealth[d]	Are healthier	3.8262	0.0717
Gmpest[d]	Contained less pesticide residues	3.8833	0.0689

[a] 1=strongly disagree……., 7=strongly agree; [b] Reference variable; [c]1=not important at all ……., 7=very important; [d] 1=definitely yes,…..., 7=definitely not.

Variables "Techfert", "Techpest", and "Secfdsupp" are constructed based on agreement with the statements that new agricultural and food technologies should focus on "reducing the amount of fertilizer used in food production", "reducing the amount of pesticide used in food production", and "assuring security of national food supply", respectively. The responses are scored on a 7-point Likert-type scale with "1" corresponding to "strongly disagree" and "7" implying that a respondent "strongly agrees". The variables are included because modified and nonconventional practices of food production aim to reduce the amount of fertilizers and pesticides or ensure a secured food supply.

Another set of variables, "Morevit", "Pestfree", and "Org", are created using the responses to the question that asks how important to the respondent is it that food "have vitamins", "be pesticide free", and "be organic produce", respectively. Sustainable food production practices include organic farming, which prohibits the use of synthetic pesticides, and the new technologies which can enrich foods with vitamins.

Nonconventional methods may include the latest technologies like GM to produce foods that have all the ingredients essential for human health. Therefore, two opinion variables are included to get the information about consumers' willingness to pay for GM foods. They are "Gmhealth" and "Gmpest" constructed based on responses to the statements "I would buy GM foods if they are healthier" and "if they contain less pesticide residues", respectively. These categorical variables are measured on a 7-point Likert-type scale where the lowest score represents "definitely yes" and the highest means "definitely no".

The Empirical Model

In this study, the dependent variables assume more than two values. Therefore, a binary logistic regression is inadequate to model the equations. The ordinal logistic regression is an extension of the binary logistic regression that takes into account the ordering of responses used in this study. The ordering applies a 7-step Likert-type scale, where the responses were measured from "1" for "strongly disagree" to "7" for "strongly agree". In ordinal logistic regression, when we consider the probability of an event, we also need to consider the probabilities of all events that are ordered. For example in this study, in order to model the odds of the event that a respondent strongly agrees with a statement, the odds of other events including strongly disagree with the statement also need to be considered. Therefore, the probabilities are calculated cumulatively.

The empirical equation takes the following form (see Table 1 for full variable definition):

$$Y = \alpha + b_1 \text{ income} + b_2 \text{ education} + b_3 \text{ age} + b_4 \text{ child} + b_5 \text{ white} + b_6 \text{ blue} + b_7 \text{ others} + b_8 \text{ east} + b_9 \text{ west} + b_{10} \text{ techfert} + b_{11} \text{ techpest} + b_{12} \text{ secfdsupp} + b_{13} \text{ morevit} + b_{14} \text{ pestfree} + \varepsilon,$$

where Y is the modeled event or the agreement regarding a food production method. Because there are four production methods in this study, we estimate four separate equations. In addition to the above listed variables, the equation on nonconventional method without the use of synthetic pesticides includes the variable "Org" and the equation on nonconventional method using latest technologies incorporates the variables "Gmhealth" and "Gmpest".

The modeling of an event includes calculating the following odds of Y:

Y_1= prob(value=1)/ prob(value>1);

Y_2= prob(value=1 or 2)/ prob(value>2);

Y_3= prob(value=1 or 2 or 3)/ prob(value>3);

Y_4= prob(value=1 or 2 or 3 or 4)/ prob(value>4);

Y_5= prob(value=1 or 2 or 3 or 4 or 5)/ prob(value>5), and

Y_6= prob(value=1 or 2 or 3 or 4 or 5 or 6)/ prob(value>6).

The seventh (last) category does not have odds because the cumulative probability of having a value of 1, 2, 3, 4, 5, 6, or 7 is one [NORUŠIS 2010].

The ordinal logistic model then takes the form of $Y_i = \alpha_i - b_j x_j$, where *i* represents the number of categories not including the last one and *j* represents the explanatory variables (1,2, ……, 14). Each category has a different intercept, but the slope coefficients are the same across different categories according to the assumption of parallel regression. If the coefficient for a particular explanatory variable has a positive sign, then higher categories are more likely to occur. A negative coefficient implies lower categories are more likely to occur, given an increase in the value of a continuous explanatory variable or change in the value from 0 to 1, if it is a binary variable. The results are further interpreted based on the marginal effects and predicted probabilities.

The initial estimations of the four equations using the ordinal logistic regression show the violation of parallel regression assumption, meaning that the slope coefficients are not the same across different categories. The violation is present in the case of two equations on nonconventional methods of food production. The usual interpretation from ordinal logistic regression results is that the assumption holds. Multinomial logistic regression is suggested to solve this problem, because it estimates a different slope coefficient for each category. However, the estimate technique does not take into account the ordering of responses [WOOLDRIDGE 2010] and is less parsimonious. The generalized ordinal logistic regression is an alternative [WILLIAMS 2010] that estimates different coefficients only for the variables that are found to violate the parallel regression assumption, while keeping the coefficients for other variables the same across categories. We follow the latter approach to estimate generalized logistic regression and report the results. Estimation is done using STATA software.

Results

This section describes results from the estimation of four equations using the generalized logistic procedure in STATA. The Brant test was applied to identify the explanatory variables that violate the parallel regression assumption [WILLIAMS 2010], with a significance level of 0.05. The violations are noticed in the case of two equations, i.e., equations on nonconventional food practices (Nonconpestfree and Nonconlatest). The variables thus diagnosed are allowed to have different coefficients across various categories. For the Nonconpestfree equation, the diagnosed variables are Income, East, and West. In the Nonconlatest equation East and West are the problematic variables. All models are globally significant with the rejection of the respective null models (high chi-square values). The low value of McFadden's pseudo R-square are not uncommon in cross-sectional studies; previous studies also report low values [for example, BRIERLEY 2008; HANK and SCHAAN 2008].

A glance at the mean values of the dependent variables (Table 1) will give a picture of the overall agreement with the statements. On average, consumers prefer foods produced through nonconventional methods without the use of synthetic pesticides and also methods using the latest technologies. However, consumers generally do not prefer to eat foods produced through conventional methods and modified methods employing need-based pesticide application.

Results from the current study are presented separately for each equation. First, results are presented with the interpretation of variables that do not violate the parallel regression assumption (Table 2) and are followed by that of variables which seem to violate such assumption (Table 3).

Preference for foods produced through conventional methods (Conven)

Table 2 provides the estimated parameters of the variables. An increase in educational attainment reduces the likelihood of preference for foods produced through conventional methods. As explained in some previous studies [ROBERTS 1996; CARRIGAN and ATTALLA 2001], ethical consumers who prefer sustainable foods are on an average well educated. Respondents from the West part of the country are more likely to prefer conventionally produced foods compared to those from Seoul. This can be attributed to availability of sustainable foods and information about its benefits in the capital city. Also, Seoul has 10 million inhabitants and the majority of people that belong to the group of ethical consumers may be residing in this city. According to VERMER and VERBEKE [2006], consumers who think that the availability of sustainable foods is low tend to have low intentions to purchase such foods.

Among the opinion variables, Techpest and Pestfree are statistically significant. Respondents who think that new agricultural and food technologies should focus on reducing the amount of pesticides are less likely to prefer foods produced through conventional methods. Similarly, respondents who consider it important to have pesticide-free foods are also less likely to prefer these foods. Other studies show that consumers with preferences similar to respondents are aware of the fact that conventional methods employ pesticides and other chemicals in food production. A study by THILMANY et al. [2008] concludes that consumers who attach importance to pesticide-free foods are willing to pay a premium for local attributes of foods. Predicted probabilities at the average of explanatory variables across seven categories are given in Table 4. Probability of a respondent to strongly disagree is 0.42 and cumulative probability for disagreement is 0.82. The figures explain that, on an average, respondents are less likely to prefer to eat foods produced through conventional methods of food production.

Table 2. The generalized logistic regression estimates for variables not violating the parallel regression assumption (coefficients across three categories do not differ).

	Estimated parameters from the equations			
Variable	Conven	Modified	Nonconpestfree	Nonconlatest
Income	-0.0000545	-0.0000162	-[a]	-0.0000491
	(-0.86)	(-0.27)		(-0.80)
Educ	-0.0678**	-0.0742**	0.0877**	0.0942***
	(-1.97)	(-2.27)	(2.56)	(2.77)
White	-0.0798	0.00529	0.0698	-0.0810
	(-0.50)	(0.03)	(0.44)	(-0.52)
Blue	0.135	0.303**	-0.111	-0.0382
	(0.85)	(1.98)	(-0.70)	(-0.24)
Others	-0.387	0.250	-0.878**	-0.987***
	(-1.08)	(0.77)	(-2.47)	(-2.86)
Age	0.00198	-0.00266	0.00924	0.0175**
	(0.23)	(-0.31)	(1.06)	(2.03)
Child	-0.151	-0.0475	0.152	0.193
	(-1.04)	(-0.33)	(1.06)	(1.36)
East	0.271	0.553***	-[a]	-[a]
	(1.63)	(3.48)		
West	0.359**	0.552***	-[a]	-[a]
	(2.30)	(3.56)		
Techfert	0.0869	0.00530	0.125	0.110
	(1.02)	(0.07)	(1.57)	(1.42)
Techpest	-0.165*	-0.00790	0.216***	0.162**
	(-1.94)	(-0.10)	(2.60)	(1.98)
Secfdsupp	-0.0993	0.00154	0.142**	0.157**
	(-1.52)	(0.02)	(2.11)	(2.35)
Morevit	-0.0155	-0.0131	-0.0476	0.0818
	(-0.30)	(-0.26)	(-0.91)	(1.60)
Pestfree	-0.190***	-0.0334	0.0683	0.147**
	(-3.28)	(-0.60)	(0.97)	(2.50)
Org	-	-	0.181***	-
			(2.81)	
Gmhealth	-	-	-	-0.148**
				(-2.41)
Gmpest	-	-	-	0.0779
				(1.24)
LR chi2	53.22	33.52	170.46[b]	144.32[b]
Pseudo R2	0.021	0.011	0.069	0.056

Note: *, ** and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively; T-statistic is in parentheses.

[a] Estimation results in Table 3. [b] denotes Wald chi2.

Table 3. The generalized logistic regression estimates with respect to the variables violating the parallel regression assumption coefficients differ across three categories[a] .

	Nonconpestfree equation			Nonconlatest equation	
	Variable name			Variable name	
Category	Income	East	West	East	West
1 = Strongly agree	-0.000823*** (-4.77)	-1.090** (-2.11)	-0.532 (-0.98)	0.240 (0.50)	0.226 (0.50)
2	-0.000268** (-2.46)	0.224 (0.69)	0.777** (2.14)	0.385 (1.17)	0.763** (2.17)
3	-0.000231** (-2.51)	0.100 (0.35)	0.411 (1.41)	0.139 (0.51)	0.433 (1.54)
4 = Neither disagree nor agree	-0.0000586 (-0.74)	-0.204 (-0.93)	0.0198 (0.09)	-0.104 (-0.48)	-0.160 (-0.77)
5	-0.000154** (-2.21)	-0.129 (-0.67)	-0.802*** (-4.35)	-0.373** (-2.00)	-0.700*** (-3.83)
6	-0.0000706 (-0.96)	0.530*** (2.77)	-0.456** (-2.23)	0.113 (0.60)	-0.832*** (-3.86)

[a] Category 7 is the base outcome.
Note: ** and *** denote statistical significance at 5 %, and 1 % levels, respectively; t-statistic is in parentheses.

Table 4. Predicted probabilities of a respondent falling into a category calculated at the mean values of explanatory variables.

	Predicted probabilities of falling into a category with respect to the presented food production technology			
Category	Conven	Modified	Nonconpestfree	Nonconlatest
1 = Strongly disagree	0.416	0.238	0.031	0.029
2	0.272	0.232	0.022	0.033
3	0.137	0.165	0.028	0.035
4 = Neither disagree nor agree	0.086	0.142	0.086	0.104
5	0.049	0.100	0.202	0.197
6	0.021	0.077	0.334	0.316
7 = Strongly agree	0.019	0.046	0.302	0.286

Preference for foods produced through modified practices employing need-based pesticide applications (Modified)

Respondents with high levels of educational attainment are less likely to prefer foods produced using the need-based pesticide application method. The result is in agreement with results of the study by ROBERTS [1996]. Regarding geographical variation, respondents from the West and East parts of the country are more likely to prefer foods produced using modified practices compared to respondents from Seoul. Particular occupational category is also found to be significant. Here, respondents in blue collar jobs are more likely to prefer these foods compared to respondents who are homemakers. The predicted cumulative probability (Table 4) of disagreement is 0.63, or slightly less than that calculated for the equation modeling preferences for foods produced using conventional methods. A probable reason might be the fact that this food production method applies pesticides only when they are needed.

Preference for foods produced through nonconventional food practices without any synthetic pesticides (Nonconpestfree)

Table 2 shows estimated coefficients that do not differ across different categories of the dependent variable. An increase in educational level of a respondent increases the likelihood of preferring foods produced through nonconventional methods without the use of synthetic pesticides. Respondents with jobs other than white and blue collar jobs are less likely to prefer these foods than homemakers.

Some of the opinion variables also are statistically significant in explaining the likelihood of preference for foods produced through nonconventional practices. Respondents who think that new agricultural and food technologies should focus on reducing the amount of pesticides (Techpest) and those who think technologies should focus on assuring the security of national food supply (Secfdsupp) are more likely to prefer foods produced through the considered method. A study by TILMAN et al. [2002] suggests that the sustainable production method is an effective strategy to be self-sufficient in food production and self-sufficiency leads to security of food supply. Another opinion variable, Org, verifies respondents' attitudes toward organic produce. Respondents who attach importance to organic produce are more likely to prefer foods produced using nonconventional methods without the use of synthetic pesticides. The result is consistent with the organic method of cultivation and avoidance of the use of synthetic chemicals.

Table 3 shows estimated coefficients for the variables that are found to violate the parallel regression assumption. In that case, each variable has different estimated coefficients for each of its seven categories. Variables Income, East, and West violate the assumption and have different estimates. A consistently negative estimate for Income in all categories informs that an increase in household income increases the likelihood of a respondent being classified in the seventh category, i.e., strongly agree. The result implies that an increase in income increases the preference for nonconventional foods. Regarding the geographical locations, respondents from the East are less likely to fall into the first category (strongly disagree), but are, at the same time, more likely to fall in the sixth rather than the last category, as compared to respondents from the Seoul. Residents of the West region are more likely to be classified in the second category and less likely in the fifth and sixth categories compared to Seoul residents. The predicted cumulative probability (Table 4) of agreement is 0.84 (for categories 5, 6, and 7), which indicates high preference for the considered foods, in general.

Preference for foods produced through nonconventional food practices using the latest technologies (Nonconlatest)

The age variable is statistically significant in the equation shown in Table 2. Similarly, an increase in age of respondents increases the preference for the foods considered in this section. An increase in the educational attainment level increases the likelihood of a respondent preferring foods produced through nonconventional methods using the latest technologies. Respondents in jobs other than white and blue collar jobs are less likely to prefer these foods than homemakers. Among the opinion variables, Techpest, Secfdsupp, Pestfree, and Gmhealth are statistically significant. Respondents who agree that new agricultural and food technologies should focus on reducing the amount of pesticides (Techpest) and those who believe technologies should focus on assuring the security of the national food supply (Secfdsupp) are more likely to prefer foods produced through the considered method. Additionally, respondents who attach importance to pest-free foods (Pestfree) are also more likely to prefer such foods,

whereas respondents willing to buy GM foods if they are healthier (Gmhealth) than non-GM foods are less likely to prefer the food produced through nonconventional methods using the latest technologies.

Table 3 shows estimated coefficients for variables that are found to violate the parallel regression assumption in the case under consideration. East and West variables violate the assumption and have different estimates. Respondents from the eastern part of the country, as compared to respondents from Seoul, are less likely to be classified in the fifth than the last category regarding the preference for food produced using nonconventional methods. Residents of the West region are more likely to fall into the second category (i.e., prefer less), but less likely to be in the fifth and sixth category (i.e., prefer more) compared to Seoul residents. The predicted cumulative probability (Table 4) of agreement (for categories 5, 6 and 7) is 0.80, which indicates, in general, a high preference for foods produced using the latest technology.

Conclusions and Implications

Overall, the results from this study are consistent with those of some previous reports [for example, ROBERTS 1996; CARRIGAN and ATTALLA 2001; VERMEIR and VERBEKE 2006; THILMANY et al., 2008]. Education and West are the only variables that are consistently statistically significant in all equations. The higher the educational level, the higher the likelihood that respondents prefer foods produced through nonconventional methods without the use of synthetic pesticides or using the latest technologies while respondents are less likely to prefer foods produced through conventional and modified practices. Respondents from West region are more likely to prefer foods from conventional or modified practices, while less likely to prefer foods produced through the other two methods, compared to Seoul residents.

Among the occupational variables, homemakers are more likely to prefer foods produced through nonconventional methods than respondents in jobs other than white and blue collar jobs and less likely to prefer foods produced through modified practices than respondents in blue collar jobs. Age is significant in the case of the fourth equation and as respondents age, they are more likely to prefer foods produced through nonconventional practices with the latest technologies.

Opinion variables also have significant influences on the preferences. Techpest and Pestfree (see Table 1 for full description) have negative estimates in the first equation (which means that respondents with positive attitudes toward these statements are less likely to prefer these foods), whereas these variables have positive estimates in the fourth equation (which translates into the increased likelihood of those respondents preferring the foods under this category). Techpest is significant in the third equation also with a positive estimate. Secfdsupp increases the likelihood of preferring foods produced by nonconventional methods. Org is significant and positive in the third equation, whereas Gmhealth is significant and negative in the fourth equation.

For a better summary of the results, predicted probabilities for a hypothetical situation are calculated and reported in Table 5. The profile consists of respondents from households with a monthly income of $4,000, who are homemakers with 13 years of education, and are 41 years old. The households are located in Seoul and have children. All the opinion variables are included at their mean values. Table 5 shows cumulative probabilities excluding the neutral category, which is listed as the fourth. The cumulative probability that these hypothetical respondents do not prefer foods produced through conventional methods is about 0.87 and foods produced by modified practices is about 0.72. The probabilities for preferring foods produced by nonconventional methods without the use of synthetic pesticides is about 0.73 and for preferring foods produced by nonconventional practices using latest technologies is about 0.85.

From these results it is clear that an average respondent prefers foods produced through nonconventional methods, which use food production methods related to sustainable production practices.

Table 5. Predicted probabilities of a respondent falling into a category calculated given hypothetical personal and household characteristics.

Category	Predicted probabilities of falling into a category with respect to the food production technology			
	Conven	Modified	Nonconpestfree	Nonconlatest
1 = Strongly disagree	0.504	0.318	0.003	0.025
2	0.255	0.252	0.019	0.038
3	0.112	0.152	0.139	0.023
4 = Neither disagree nor agree	0.065	0.117	0.012	0.065
5	0.036	0.076	0.099	0.124
6	0.015	0.054	0.373	0.334
7 = Strongly agree	0.013	0.031	0.355	0.392

Hypothetical scenario: Respondent is from a household with a monthly income of $4000; has 13 years of formal education; is homemaker (homemaker=1); has children (child=1); household is located in Seoul (Seoul=1); all opinion variables are at their mean values.

The results from this study have policy implications for government and also for marketing agencies. Both groups may want to increase the consumption of foods produced through nonconventional and also by modified practices, so that farmers are assured of a sustaining market for their produce. Probabilities for different profiles of respondents can be calculated to identify the segments that prefer or do not prefer a particular type of food. Based on such knowledge, agencies involved in the promotion of foods produced by nonconventional and modified practices can locate marketing segments and increase the awareness of specific consumers. Apart from the socioeconomic and demographic variables, consumers' attitudes also play a role in the market promotion of these foods and in the education of consumers regarding food benefits. For example, respondents who agree with the objective of new agricultural and food technologies in reducing the amount of pesticides prefer foods produced through nonconventional practices. Following an observation by VERMEIR and VERBEKE [2006], to promote such foods, marketers and government policy makers should direct their efforts to assure respondents in their opinions. Coordinated efforts by both marketers and government policy makers will increase the production and consumption of such foods, which in turn will benefit both consumers and farmers in future leading to sustainable agricultural development in the country.

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