Toward the Development of Marketing Strategies for Food Safety Attributes*

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Groups of consumers reporting similar food safety concerns and shopping behaviors are identified using cluster analysis. The demographic characteristics of three distinct groups of consumers are described. The results suggest that the potential market for foods emphasizing safety attributes is large. However, significant differences in perceptions and reactions regarding food safety hazards are found. These differences are used to derive important implications for food marketing strategies and food safety policies. Future research issues are identified.

INTRODUCTION

Research indicates that food safety concerns are important to consumers.[1] In its 1988 survey of consumers, the Food Marketing Institute (FMI) found that 83% of all respondents considered product safety to be a very important factor in food selection, and another 15% considered product safety to be somewhat important.[2] Little is known, however, about the relationship between consumer concerns toward food safety and food shopping behavior.[3] That is, how do preferences regarding safety attributes of foods influence demand? An understanding of

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this relationship would greatly enhance the usefulness of survey results documenting levels of consumer concern about food safety.

There is a need throughout the food marketing system to understand how product attributes related to food safety affect purchasing behavior.[4] At the farm level, for example, producers interested in lowering the use of farm chemicals may face higher per-unit costs compared to those still using prevailing farming practices.[5] Nonetheless, it may be profitable to reduce chemical use if consumers would be willing to pay an adequate premium for foods considered to have reduced risks from chemical residues. To develop appropriate marketing strategies, food processors and distributors interested in introducing products with new safety features need to know more about consumer preferences regarding food safety risks.

Understanding the relationship between food safety characteristics and consumer demand is also important for policy makers responsible for ensuring a safe food supply. How much government regulation is required to control food safety hazards or conversely, how much of the regulatory burden can be shifted to the market? Companies already have emerged to fulfill marketing niches for consumers desiring more stringent screening for potential food safety hazards. California-based Nutriclean, for example, offers a pesticide testing program for retailers and a certification program for growers.[6,7] An assessment of the extent to which market forces could provide foods having levels of safety risk desired by consumers requires, at the very least, an understanding of the linkage between consumers' attitudes and shopping behaviors.

The purpose of this study is to advance the current state of knowledge about consumer shopping behavior as it relates to food safety considerations. This main goal comprises three specific objectives. The first is to identify groups of consumers reporting similar food safety concerns and shopping behaviors. The second is to describe the demographic characteristics of the groups of consumers identified under the first objective. Finally, the third objective is to suggest implications for food marketing and regulation on the basis of the information generated under the first two objectives.

The following section describes the methods used to identify and characterize shoppers by attitudes and actions regarding food safety. The third section presents the results of this analysis. Implications for producers, retailers, and policy makers are drawn in the fourth section of the article, and future research issues are outlined in the final section.

DATA AND METHODS

The annual FMI survey of supermarket shoppers[2] is a widely quoted source of information about consumers' food safety concerns. This survey is also a well respected source of information tracking shopper buying preferences and desires, health and nutrition concerns, time-saving and economizing practices, and demographics. As such, these data serve as a useful starting point for analyzing the relationship between consumers' shopping behaviors and attitudes regarding food safety.

Consumer responses from the 1987 FMI survey were obtained for this study. These data were collected through telephone interviews of 1007 supermarket shoppers in January 1987. The representative nationwide sample included "only

heads of households who have primary or equally-shared responsibility for food shopping, and who had shopped for groceries in the past two weeks."[2]

Cluster analysis, a commonly used tool in marketing studies, was adopted to identify groups of consumers reporting similar food safety concerns and shopping behaviors.[8] FASTCLUS, a SAS clustering procedure recommended for large data sets, was selected to conduct the analysis.[9] This iterative procedure places observations into clusters by minimizing the sum of the squared distances between all observations and their cluster means. Thus, observations within clusters tend to be similar and observations assigned to different clusters tend to be dissimilar.

Responses to survey questions about attitudes and actions regarding food safety, nutrition issues and marketing responsiveness were utilized in the cluster analysis. Although academicians typically distinguish between food safety and nutrition concerns, often the distinction is blurred in the minds of consumers.[1] For this reason, and because of the likely high positive correlation between consumer responses regarding nutrition concerns and food safety issues,[10] survey questions addressing both food safety and nutrition concerns were incorporated in the analysis.

The particular shopping behaviors chosen to form the clusters were those related to price responsiveness. In addition to price, consumers' food choices also depend on other product attributes such as convenience and quality. These other possible tradeoffs were presumed to be of secondary importance relative to price. As such, these tradeoffs were not included in the cluster analysis, but were evaluated once the clusters were selected.

The specific survey questions used to determine the clusters and the mean responses by cluster are presented in Table I. Also included in Table I are the mean values for two composite variables measuring the average response of consumers to all the food safety attitudes and actions and marketing response statements. Tables II, III, and IV summarize the mean responses by cluster for additional survey questions regarding food safety and nutrition concerns, consumer actions on nutrition issues, and shopper preferences. Table V describes the demographic characteristics of each cluster.

Cluster averages and tests of the equivalence of these averages were determined using the General Linear Models procedure in SAS. The significance levels reported in the tables incorporate an adjustment for testing simultaneous hypotheses, as traditional significance levels are appropriate for single prespecified hypotheses only.[11] For a given critical value, significance levels for simultaneous hypotheses are larger than those for single hypotheses. The significance levels of .15, .03, and .003 for the Bonferroni tests reported in the tables result from the use of critical values corresponding to traditional significance levels of .05, .01, and .001.

CLUSTER DESCRIPTIONS

Although an upper limit of five clusters was stipulated, the cluster analysis identified only three groups of consumers that were distinct from each other in terms of attitudes toward nutrition and food safety as well as responsiveness to price and sales promotion efforts. Composite responses reported in Table I show that cluster 1 consumers were very concerned about safety issues, but appeared

Table I. Consumer Food Safety Attitudes, Actions, and Marketing Responses, by Cluster.

Q. The following are statements that other people have made. For each one, please tell how close it comes to describing you—(1) very close, (2) somewhat close, (3) not very close, or (4) not close at all.

Statement	Mean Response by Cluster 1	2	3
Feel concerned that some ingredients added to processed goods may be unsafe	1.41	1.46	3.08[b]
Feel food in supermarkets is wholesome and safe to eat	1.59[a]	1.47	1.44
Prefer to buy items with tamper-resistant packaging	1.34	1.31	1.63[b]
Avoid buying foods because concerned about their safety	1.53	1.49	3.24[b]
Check the dates on dated foods	1.30	1.22	1.75[b]
Check the packaging of foods	1.19[a]	1.08[a]	1.32[a]
Pay attention to ingredients	2.04[b]	1.76[b]	3.44[b]
Composite Response	1.49[b]	1.40[b]	2.27[b]

Q. How often do you do the following—(1) pretty much every time you shop, (2) fairly often, (3) only occasionally, or (4) never?

Statement	Mean Response by Cluster 1	2	3
Look in newspapers for grocery specials	3.03[b]	1.52[b]	2.71[b]
Use price-off coupons	2.79[b]	1.51[b]	2.50[b]
Compare prices at different supermarkets	3.17	1.65[b]	3.22
Go to supermarkets other than principal one for advertised specials	3.27	2.21[b]	3.27
Composite Response	3.06[b]	1.72[b]	2.92[b]

[a]Mean response different from other clusters at .03 level of significance.

[b]Mean response different from other clusters at .003 level of significance.

Note: Significance levels based on Bonferroni test of simultaneous hypotheses.

Source: *Trends: Consumer Attitudes and the Supermarket 1987* survey by the Food Marketing Institute.

to be the least conscious of price. Cluster 2 shoppers, by contrast, reported intensive price-shopping behavior but were also concerned about food safety and nutrition issues. Cluster 3 shoppers expressed the least concern about safety and nutrition issues and engaged infrequently in price-shopping activities.

Cluster 1

Representing 38.7% of the population, shoppers in cluster 1 were highly concerned about food safety. These shoppers identified themselves as not only concerned about the safety of some ingredients added to processed foods, but also claimed to avoid buying certain foods because of safety concerns (Table I).

Cluster 1 shoppers were likely to check dates on foods, preferred tamper-resistant packaging and were least likely to agree with the statement that they trust supermarket foods. They were highly concerned about health hazards associated with additives and preservatives, nitrates, pesticide and herbicide residues, and antibiotics and hormones in animal feed. They also expressed high concern over sugar and salt in foods, cholesterol and fats (Table II).

Cluster 1 shoppers showed concern about the diet of their families, with most stating that they frequently served nutritional snacks and selected foods to balance the family's diet (Table III). Cluster 1 shoppers considered the availability of nutrition and health information in grocery stores to be only somewhat important (Table IV), and thus apparently relied on other sources for such information.

High levels of concern regarding nutrition and food safety and at least some reflection of these concerns in their shopping behaviors describe the shoppers in cluster 1. Nonetheless, these shoppers were less likely than the safety conscious consumers in cluster 2 to pay attention to the list of ingredients on processed foods, read labels for nutritional content, or check the packaging of food (Table I).

Table II. Consumer Food Safety and Nutrition Concerns, by Cluster.

Q. How concerned are you about the following items? Would you say that each is: (1) a serious health hazard, (2) somewhat of a hazard, (3) not a hazard at all, or (4) do not know. Each group of five items was read to approximately half of the survey population.

	Mean Response by Cluster		
Statement	1	2	3
Group One:			
Additives and preservatives	1.61[b]	1.78[b]	2.24[c]
Nitrates in food	1.71[a]	1.90[a]	2.31[c]
Sugar in food	1.83	1.88	2.14[c]
Cholesterol	1.51	1.49	1.89[c]
Fats	1.47	1.41	1.88[c]
Composite for Group One	1.63	1.69	2.09[c]
Group Two:			
Artifical coloring	1.99	1.90	2.39[c]
Residues such as pesticides and herbicides	1.26	1.24	1.50[c]
Antibiotics and hormones in poultry and livestock feed	1.55[a]	1.39[a]	1.77[c]
Irradiated foods	2.00	2.01	2.39[b]
Salt in food	1.65	1.59	1.94[c]
Composite for Group Two	1.69	1.63	2.02[c]

[a]Mean response different from other clusters at .15 level of significance.
[b]Mean response different from other clusters at .03 level of significance.
[c]Mean response different from other clusters at .003 level of significance.
Note: Significance levels based on Bonferroni test of simultaneous hypotheses.
Source: *Trends: Consumer Attitudes and the Supermarket 1987* survey by the Food Marketing Institute.

Table III. Consumer Actions on Nutrition Issues, by Cluster.

Q. How often do you do each of the following—(1) frequently, (2) occasionally, (3) rarely, or (4) never?

Statement	Mean Response by Cluster		
	1	2	3
Check for government grading on meat and poultry	1.95	1.83	2.36[c]
Check labels for protein and fat	1.85[b]	1.67[b]	2.58[c]
Serve nutritional snacks, such as fruits and vegetables	1.40	1.32	1.64[c]
Select recipes for their nutritional content	1.93	1.85	2.68[c]
Select foods to balance family's diet	1.43	1.34	1.90[c]
Check labels for caloric content	2.00[a]	1.82[a]	2.46[c]
Composite	1.76[b]	1.63[b]	2.27[c]

[a]Mean response different from other clusters at .15 level of significance.

[b]Mean response different from other clusters at .03 level of significance.

[c]Mean response different from other clusters at .003 level of significance.

Note: Significance levels based on Bonferroni test of simultaneous hypotheses.

Source: *Trends: Consumer Attitudes and the Supermarket 1987* survey by the Food Marketing Institute.

Although responsive to food safety considerations, cluster 1 shoppers exhibited limited responsiveness to price-oriented promotion. Cluster 1 shoppers only occasionally looked in newspapers for grocery specials, used price-off coupons or compared prices at different supermarkets (Table I). Not surprisingly, these shoppers had the highest dollar expenditures on groceries per household member per week—$28.25 (Table V).

Cluster 1 shoppers were evenly represented geographically across the country (Table V). Their average age was 43 and they had a higher representation of males (44%) that did the survey sample (40%). Cluster 1 shoppers had a higher than average household income (approximately $29,854 per year compared to the sample average of $26,126). Compared to the rest of the sample, a higher proportion of these shoppers obtained college degrees. A high percentage of these shoppers were single (37%) and 63% of them worked outside the home. The average number of children for cluster 1 shoppers was 1.88, which was slightly less than the sample average (1.98).

Cluster 2

Shoppers in cluster 2, comprising 37.3% of the sample, were highly concerned about food safety and nutrition issues and were likely to act on those concerns (Table I). They were most likely to pay attention to the list of ingredients on processed foods and read labels for nutritional content. Cluster 2 shoppers also checked the packaging and dates on foods. Like cluster 1 shoppers, cluster 2 shoppers were concerned about some ingredients added to processed foods and would not buy food whose safety was in question. Similarly, cluster 2 shoppers were highly concerned about additives and preservatives, nitrates, chemical

Table IV. Shopper Preferences, by Cluster.

Q. The following is a series of statements that may or may not describe you as a grocery shopper. For each one, please tell how close it comes to describing you—(1) very close, (2) somewhat close, (3) not too close, or (4) not at all close.

Statement	Mean Response by Cluster		
	1	2	3
I like to browse in the supermarket	2.38[b]	2.00[c]	2.59[b]
I shop for the best bargains	1.85	1.22[c]	1.92
I read newspapers ads to see what store offers best buys	2.96	1.63[c]	2.92
I carefully read labels for nutritional content	2.11[c]	1.83[c]	3.20[c]

Q. For each factor that may or may not be important when a person decides where to shop, please tell whether it is (1) very important, (2) somewhat important, (3) not too important, or (4) not at all important to you when you select a primary food store.

Factor	Mean Response by Cluster		
	1	2	3
Good/low prices	1.51	1.21[c]	1.53
Quality produce, fruits and vegetables	1.17	1.11	1.23[c]
Items on sale or money-saving specials	1.91	1.38[c]	2.00
Nutrition and health information available for shoppers	1.93[c]	1.64[c]	2.56[c]

[a]Mean response different from other clusters at .15 level of significance.
[b]Mean response different from other clusters at .03 level of significance.
[c]Mean response different from other clusters at .003 level of significance.
Note: Significance levels based on Bonferroni test of simultaneous hypotheses.
Source: *Trends: Consumer Attitudes and the Supermarket 1987* survey by the Food Marketing Institute.

residues, and antibiotics and hormones in animal feeds, as well as sugar and salt in foods, cholesterol, and fats (Table II). Cluster 2 shoppers also served nutritional snacks and selected foods to balance their families' diets (Table III). Shoppers in cluster 2, however, were more likely than those in cluster 1 to check labels for protein, fat and caloric content.

Unlike their cluster 1 counterparts, cluster 2 shoppers were responsive to promotional efforts such as newspaper advertising and price-off coupons, and were most likely to compare prices or switch supermarkets for specials (Table IV). Shoppers in cluster 2 were the most likely of the three groups to browse when shopping and were most likely to want nutrition and health information available in stores. Cluster 2 shoppers considered price a very important determinant for where they shopped and also searched for items on sale. Possibly as a result of this price searching behavior, these shoppers had the lowest food bill per week per household member—$23.77 (Table V).

Demographically, cluster 2 shoppers were significantly different from shoppers in clusters 1 and 3 in a number of respects (Table V). Cluster 2 shoppers on average were older and were predominantly female (69% compared to the sample

Table V. Consumer Demographic Characteristics, by Cluster.

Characteristics	Mean Response by Cluster		
	1	2	3
Age	43	46(3)[b]	42(2)[b]
Sex (%Female)	56	69[c]	54
Married (%)	63	75[a]	67
Works outside home (%)	65	49[c]	65
Income: Low [0,$15000]	21	27	20
Middle [$15001,$35000]	40	44	41
High [$35001+]	38	29[b]	39
Grocery Expenditures per Household Member	28.26	23.77[c]	26.36
Education: Less than High School Graduate	12	16(3)[a]	10(2)[a]
High School to Some College	55(2)[b]	66(1)[b]	59
College Graduate to Graduate School	33	17[c]	30
Race: White(%)	86	83	94[b]
Region: Northeast(%)	21	23	19
West(%)	20	16(3)[a]	24(2)[a]
South(%)	34	37(3)[a]	29(2)[a]
North Central(%)	25	24	29
Children	1.88(2)[a]	2.12(1)[a]	1.92
% of Sample	39	38	24

[a]Mean response different from all other clusters (or cluster in parentheses) at .15 level of significance.

[b]Mean response different from all other clusters (or cluster in parentheses) at .03 level of significance.

[c]Mean response different from all other clusters (or cluster in parentheses) at .003 level of significance.

Note: Significance levels based on Bonferroni test of simultaneous hypotheses.

Source: *Trends: Consumer Attitudes and the Supermarket 1987* survey by the Food Marketing Institute.

population of 60%). They had the largest proportion of married shoppers and only 49% of the cluster worked outside the home. Compared to the other groups, slightly more cluster 2 shoppers were from the South and slightly fewer from the West. The average number of children for cluster 2 was 2.12, the largest of the three clusters.

The food safety conscious cluster 2 shoppers were more highly concentrated in the lower income bracket (their average income of $25,836 was significantly lower than that for clusters 1 and 3) and had significantly lower levels of education, with only 17% having graduated from college. There are two probable explanations for the intensive price shopping behavior and responsiveness to food safety concerns exhibited by these shoppers. First, many of these lower income families had only one spouse working and thus, may have had more time to search for reasonable prices and desired safety attributes while shopping. Secondly, food safety issues are quite complicated and attempts to sort out the issues are made more difficult by the often superficial accounts of "headline

making" food safety news published by the press. Fear of the unknown may be the motivating force behind the food safety concerns and behaviors reported by this group of consumers.

Cluster 3

Cluster 3 shoppers, representing 23.9% of the sample, were the least concerned about food safety and nutrition issues and consequently least likely to take time to ensure that the foods they purchased were wholesome and safe to eat (Table I). They were highly unlikely to pay attention to ingredients or read labels for nutritional content and least likely to state that they would not buy goods identified as potentially unsafe. Shoppers in cluster 3 did check expiration dates and packaging, but not as frequently as those in clusters 1 and 2. They were much less concerned about additives and preservatives, pesticide and herbicide residues, and other safety issues (Table II).

There was an even wider difference between cluster 3 shoppers and the others in behavior relating to family nutrition (Table III). Cluster 3 shoppers were least likely to select nutritious recipes, select food to balance their families' diets, serve nutritional snacks, or check labels for protein, fat, and caloric content. Likewise, shoppers in this group checked for government grading on meat and poultry less often than did consumers in the other two clusters. They were least likely to have changed their methods of cooking or preparing food in the last three to five years.

Cluster 3 shoppers, like those in cluster 1, only occasionally responded to promotional efforts, although they were more likely than shoppers in cluster 1 to use coupons or read newspapers for specials (Table I). Cluster 3 shoppers seldom used price as a deciding factor in where to shop. Lack of time may be critical for shoppers in cluster 3, as they were least likely to want to browse when shopping (Table IV). They were also least likely to want nutrition and health information available for shoppers at the store. The average grocery bill for cluster 3 shoppers was $26.36 per person per week (Table V).

Cluster 3 shoppers were similar demographically to those in cluster 1, with only one statistically significant difference found among the variables considered (Table V). Cluster 3 shoppers were young, with an average age of 42, and had a high representation of males (46% compared with the survey population of 40%). They had a high average income ($31,402) and high levels of education—more than 30% graduated from college. A larger than average percentage of consumers in cluster 3 worked outside the home (67 vs. 59%), while the percentage married was close to the sample average.

As with cluster 1, higher than average levels of income and the lack of time may explain the generally lower levels of responsiveness to product promotion for cluster 3 shoppers. Less obvious is the reason for the sharp contrast in level of food safety concerns between clusters 3 and 1. Some of the differences in these levels of concern may be explained by the fact that cluster 3 shoppers were younger and included a larger proportion of males when compared to cluster 1. These differences, however, were found to be statistically insignificant. Racial composition was the only demographic variable that differed significantly between the two clusters. The largely unconcerned shoppers in cluster 3 consisted of a larger percentage of whites than either of the other two clusters.

IMPLICATIONS

Consumers in clusters 1 and 2 (three-fourths of the sample) reported being concerned about food safety issues and their stated behaviors reflect these concerns. Thus, the potential market for foods perceived to have reduced safety risks is large, although perceptions of "safety" very likely include some nutritional attributes.

Differences in the price shopping behaviors exhibited by clusters 1 and 2, however, suggest that the willingness and ability of these shoppers to pay for food safety may not be uniform. Compared to those in cluster 1, the more intensive bargain hunting by cluster 2 shoppers suggests that they may be less inclined or able to pay substantially higher prices for "safer" foods. Although the significantly lower average income of the shoppers in cluster 2 may substantially constrain their grocery expenditures, they are willing to spend considerable time and effort in searching for safer foods.

A reasonable strategy for marketing foods with reduced food safety risks would be initially to target consumers similar to those in cluster 1. Because these consumers are relatively insensitive to price and yet very concerned about food safety, the potential exists for generating substantial profits from this market niche. Cluster 2 shoppers also would be attracted to foods emphasizing safety attributes, but would be more likely to compare prices across similar products. Hence, potential profits from sales to cluster 2 shoppers may be smaller than those available from sales to cluster 1 shoppers.

The characterizations of clusters 1 and 2 indicate that different promotional strategies may be required to reach the two types of concerned consumers. Shoppers in cluster 1 pay little attention to newspaper advertisements or coupons. Further, they are not very likely to compare supermarkets or go to a different supermarket for an advertised special. Cluster 2 shoppers, on the other hand, read newspapers for specials, clip coupons, and want nutrition and health information available in the store.

Although probably not responsive to local promotional efforts, shoppers in cluster 1 may be more likely to notice mass media advertisements on television and radio, and in magazines. Rather than price, such advertisements should emphasize product differentiation based on food safety attributes. Cluster 2 shoppers may be more responsive to local price-oriented promotional efforts. Local newspaper advertising, coupons, and in-store promotions likely would attract the attention of these shoppers.

Shoppers in cluster 3 are relatively insensitive to both food prices and safety issues. If these shoppers could be persuaded that the wholesomeness of their diets should be a concern, they may not object to paying higher prices for reduced food safety risks. Given that this group seems apathetic about grocery shopping, it is unclear how to catch the attention of these consumers. Furthermore, it would be difficult to reach these consumers with targeted educational campaigns because they are demographically indistinguishable from cluster 1 consumers based on the available demographic attributes.

Although the federal government currently sets minimum safety standards for most foods, this analysis suggests that three-fourths of the population (namely clusters 1 and 2) may prefer higher standards. If the provision of these higher standards is left to the market, the budget constraints faced by consumers in

cluster 2 may deter them from purchasing foods with desired levels of safety risks. Cluster 3 shoppers, on the other hand, apparently choose not to concern themselves with food safety issues. If the minimum standards do not adequately reduce food safety risks, these shoppers may be the most susceptible to illness resulting from food safety hazards. From a social welfare perspective, too low of a minimum safety standard will not be optimal as it leads to higher health care costs and less productive or shorter lives. Society bears part of these costs because they are not fully internalized by individuals. The regulatory dilemma is to develop and implement policies that are consistent with the dissimilar attitudes and behaviors of the three types of consumers identified herein. Even though implementation of an array of policies targeted toward different consumer groups poses difficulties, differences across consumers must be recognized to make appropriate compromises in the formation of public policies.

FUTURE RESEARCH ISSUES

This study has extended earlier research documenting consumer concerns over food safety issues. Specifically, a classification of consumers was developed to draw some general links between consumers' attitudes toward food safety and grocery shopping behaviors. Three distinct groups of consumers were identified and described. As is often the case in marketing studies using cluster analysis, few demographic differences between the three clusters were found.[12] Nonetheless, the analysis provided useful information for food producers, manufacturers, distributors, and policy makers. Further research, however, is needed to determine the impacts of food safety issues on consumer demand, marketing system organization and performance, and public policy. The following recommendations focus mainly on consumer demand and food safety issues.

More research is needed to determine how consumers make choices regarding food safety. For example, shoppers such a those in cluster 2 may prefer to reevaluate food choices frequently in order to minimize expenditures. Consumers such as those in cluster 1, on the other hand, may have higher opportunity costs of time. Such consumers may be more likely to choose a brand that they regard as being safe, rather than switching between brands as relative prices change.

Our findings show qualitatively that perceptions and reactions regarding food safety hazards differ among consumers. Further research is needed, however, to quantify the demand for food safety attributes. How does a real or perceived reduction in a safety risk influence the demand for a product? How much of a premium are consumers willing to pay for a given reduction in food safety risks? How do consumers balance price, safety attributes, and other characteristics of foods? Answers to these questions are needed urgently by all those involved in the food marketing system.

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