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# Analyzing Agri-food Consumer Competency in Korea : Policy Directions and Business Opportunities*

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## Abstract

**Purpose:** This study aims to measure the Agri-food Consumer Competency Index (ACCI) in Korea, identify factors influencing consumer competency, and classify consumers into distinct competency groups. Policy recommendations and potential business opportunities are proposed based on the findings. **Research design, data, and methodology:** Data from the Consumer Behavior Survey for Food were analyzed using complex sample analysis and latent class analysis (LCA). Competency scores were compared by gender, age, region, education, and income. Key factors, including consumer education and participation in consumer group events, were examined for their impact on competency. **Results:** The 2021 ACCI score was 72.0 out of 100, slightly higher than in 2016. However, 57.5% of adult consumers were categorized as having low competency. Significant differences in competency were observed across demographic groups, with women, older adults, and urban residents scoring higher. Participation in consumer education and group events positively influenced competency, while government-sponsored promotional events showed no significant effect. **Conclusions:** To address low consumer competency, targeted consumer education programs are recommended for rural areas, low-income households, and specific occupational groups, including soldiers, agricultural workers, and students. Remote education through TV and media appears more effective than social media for improving competency among low-competency consumers. As government consumer education initiatives rely heavily on outsourcing to private institutions, the findings of this study are expected to enhance policy design and present new business opportunities for private education providers.

**Keywords :** consumer behavior, complex sample, consumer competency, ACCI

**JEL Classification Code** : I12, I18, I21, J18

## 1. Introduction

The Framework Act on Consumers in Korea addresses consumers' rights and responsibilities in Chapter 2. It clearly specifies that consumers should have fundamental rights as well as the means to exercise them effectively. In other words, the law recognizes consumers not merely as passive recipients of protection but as autonomous agents who can actively exercise their rights, a concept referred to as "consumer sovereignty."

The Korea Fair Trade Commission (KFTC) has been pursuing consumer policies aimed at enhancing consumer capabilities to realize consumer sovereignty. As part of this effort, the KFTC initiated a foundational study in 2007 to develop the "Consumer Competency Index," a quantified measure of consumer competence in Korea (Lee et al., 2007). Since then, the Korea Consumer Agency has conducted further research on the measurement and evaluation of consumer competency, completing surveys in 2010, 2014, 2018, and 2022. These surveys have been used as

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foundational data for consumer policy development and education strategies.

The concept of "consumer competency" has evolved over time. Lee et al. (2007) defined it as "the desirable mindset and behavioral patterns that modern consumers should aim for." Bae and Chun (2010) defined it as "the potential and practical abilities consumers must possess to lead a wise and sustainable consumer life in a changing consumer environment." Later, Son, and Lee (2014) further refined the definition, describing it as "a comprehensive set of consumer knowledge, attitudes, and practices required to fulfill consumer roles in a market economy and civil society." Oh and Bae (2018) also defined consumer competency as "the totality of abilities required for consumers to effectively perform their roles." These definitions reflect the idea that consumer competency is fundamentally a concept of consumer ability from a sovereignty perspective, which can vary based on changes in the consumer environment.

The ultimate goal of developing the Consumer Competency Index (CCI) is to strengthen consumer competency, which lies at the core of consumer policy. The index serves as both a benchmark and a performance indicator. In other words, CCI allows for diagnosing current situations, and through structured analysis by sector, it can identify areas and groups that require intervention, such as education. For example, based on the 2007 analysis of CCI, the KFTC formulated consumer education plans targeting seniors, adolescents, low-income households, and immigrant spouses.

Through recent studies on consumer issues, we can see why the CCI is crucial for addressing consumer problems and improving consumer life. Yoo et al. (2018) argued that consumer competency is a significant factor influencing consumer problem experiences, consumer life anxiety, and consumer satisfaction. They particularly highlighted the importance of consumer competency in preventing consumer problems in advance. Jeon et al. (2021) compared and analyzed consumer competency by region to propose customized consumer administrative services for the 1,372 Consumer Counseling Center. In the financial sector, Kwak (2019) developed a competence index for insurance consumers and conducted an analysis to enhance consumer competency in the insurance field. Yu et al. (2019) found that consumer competency significantly reduces consumer anxiety about unfair transactions in loan and insurance products, emphasizing the strengthening of consumer competency as a way to manage consumer anxiety. In the telecommunications sector, Yang (2014) proposed a competency index to evaluate consumer competency in telecommunications services, and Kim et al. (2015) suggested that consumer competency in the telecommunications sector contributes to consumer satisfaction with telecommunication service fees and ultimately enhances overall consumer satisfaction with telecommunication services.

In the agri-food sector, the need for a competency index to promote consumer policies has also grown. Lee et al. (2014) were the first to propose an "Agri-food CCI (ACCI)" applicable to the agri-food sector. Their study conceptualized the index as "the potential and practical abilities consumers need to lead a wise and sustainable consumer life in the agri-food sector, as well as the totality of the food consumption environment." Following Lee et al.'s (2014) research, the development of ACCI was realized through the Korea Rural Economic Institute's (KREI) "The Consumer Behavior Survey for Food (CBSF)" Since 2013, the KREI has been conducting this national-scale survey. From the fourth survey in 2016, questions related to ACCI were included and have been surveyed annually.

Since the release of CBSF, research highlighting the significance of consumer competency in the agri-food sector has been steadily growing. Jeon (2018) argued that strengthening consumer competency among different types of single-person households, such as those seeking small packaging or those pursuing gourmet, convenience, and price, could enhance their satisfaction with dietary habits. Lee (2019) found that among the various dimensions of agri-food consumer competency, use of food information competency was a key variable in raising awareness of the food labeling system. Kim et al. (2021) confirmed that consumers with higher competency levels showed greater interest in domestic agricultural products, locally produced foods, and eco-friendly foods, and that there were significant differences in their willingness to pay for domestic agricultural and seafood products, dining out, and school meals compared to imported foods. Lee et al. (2021) found that healthy dietary competency positively influenced consumer satisfaction with early-morning delivery of fresh foods, which in turn increased their repurchase intention. Kim et al. (2022) demonstrated that consumer competency in agri-food purchasing and dietary habits influenced consumer perceptions of food safety as well as their interest in product origins.

This study aims to calculate ACCI, analyze the factors influencing agri-food consumer competency, and categorize consumers into distinct groups. Based on these findings, it seeks to propose policy recommendations and identify potential business opportunities. As previously discussed, the importance of ACCI has been growing, and a relatively large number of studies have used it as an explanatory variable. However, there has yet to be a study that uses the index as a dependent variable to analyze the factors influencing its levels and attempt consumer group classification based on the index.

This study analyzes the CBSF data from the KREI. It identifies influencing factors such as dietary education and

promotional activities through complex sample regression analysis. We conduct latent class analysis (LCA) to classify consumer groups based on their dietary competency and examine the characteristics of each group to propose efficient directions for consumer dietary education.

The structure of this paper is as follows: Chapter 2 introduces the data and describes the composition and calculation methods of ACCI. Chapter 3 presents the results of the index calculation, descriptive statistics of the complex sample analysis, regression analysis, and latent class analysis. Finally, Chapter 4 summarizes the results and discusses the implications.

## 2. Data and Methods

### 2.1. Data

#### 2.1.1. Survey Participants

The CBSF consists of three surveys: primary food purchasers, adult household members, and adolescent household members. In the case of primary purchasers, respondents are required to participate in both the primary food purchaser survey and the adult household member survey. The primary food purchaser survey targets food purchasers aged 18 to under 75, while the surveys for adult and adolescent household members cover household members aged 13 to under 75 (both adults and adolescents).

The 2021 survey involved a total of 3,318 households across the country. It collected responses from 3,318 primary food purchasers, 6,355 adult household members, and 606 adolescent household members. Meanwhile, according to Article 2, Clause 1 of the Enforcement Rules of the Bioethics and Safety Act, the survey is exempted from review by an Institutional Review Board as it qualifies as research conducted directly or commissioned by the national or local government for the purpose of reviewing or evaluating public welfare or service programs.

#### 2.1.2. Survey Method

The survey was conducted through household visits by surveyors who performed face-to-face interviews. The primary food purchaser survey was carried out using CAPI (Computer-Assisted Personal Interviewing) for the in-person interviews. For the adult and adolescent household member surveys, participants had the option to complete a self-administered questionnaire or respond via an online survey by receiving a web survey URL. Respondents were able to choose between these two methods. The survey is conducted annually. The 2021 survey was conducted by Embrain Public from May 25 to August 6, 2021 (Lee et al., 2021).

### 2.2. Agri-food Consumer Competency Index

#### 2.2.1. Composition of ACCI

The CBSF adult household member survey includes ACCI questions. ACCI consists of a total of 56 questions categorized into 9 subcategories under 3 major sections. The 3 major sections are divided into i) *food selection stage*, ii) *cooking and consumption stage*, and iii) *consumer rights and responsibilities stage*.

*The food selection stage* includes questions related to consumers' decisions when purchasing agri-food products, selecting ingredients, or choosing restaurants. The subcategories in this section cover the use of agri-food labels, the use of agri-food information, and the purchasing environment for agri-food products. *The cooking and consumption stage* pertains to questions regarding food preparation, cooking and consumption. The subcategories focus on healthy eating habits, safe eating practices, and traditional eating habits. The inclusion of "traditional eating habits" as a component of consumer competency is likely based on Article 12 (Succession of Traditional Dietary Culture and Use of Local Agricultural and Marine Products) of the Dietary Education Support Act. Finally, *the consumer rights and responsibilities stage* consists of questions regarding the rights and responsibilities that consumers must uphold as citizens. The subcategories in this section include questions on consumer rights, consumer responsibility, and problem-solving as a consumer.

Questionnaire was structured to first address knowledge and attitudes, followed by inquiries about the implementation of the item and the intention to implement it. Both the knowledge and attitude section and the implementation and intention section consist of 28 questions each, ensuring equal distribution.

**Table 1:** Composition of ACCI

| Composition | | No. of questions | | |
|---|---|---|---|---|
| | | Knowledge and attitudes | Implementation and intent | Total |
| Ⅰ. Food selection stage | Use of labels | 4 | 4 | 8 |
| | Use of information | 3 | 3 | 6 |
| | Purchasing environment | 2 | 2 | 4 |
| Ⅱ. Cooking and consumption stage | Healthy eating | 5 | 5 | 10 |
| | Safe eating | 2 | 2 | 4 |
| | Traditional eating | 2 | 2 | 4 |
| Ⅲ. Consumer rights and responsibilities stage | Consumer rights | 4 | 4 | 8 |
| | Consumer responsibility | 4 | 4 | 8 |
| | Problem solving | 2 | 2 | 4 |
| Total | | 28 | 28 | 56 |

#### 2.2.2. Calculation of ACCI

The questions related to ACCI are measured on a 5-point Likert scale. However, there is no predefined method for calculating the index. For this study, the calculation method used by the Korea Consumer Agency's CCI was referenced. The Korea Consumer Agency converts the 5-point Likert scale into a 100-point scale, where each point on the Likert scale is spaced 20 points apart. Specifically, 1 is converted to 20 points, 2 to 40 points, and so on.

Bae and Chun (2010) explained the reason for this conversion method revision by noting that the earlier method used for the 2007 CCI converted 1 to 0 points, 2 to 25 points, 3 to 50 points, 4 to 75 points, and 5 to 100 points. This resulted in 50 points being assigned to a rating of "neutral," which often led to underestimation, as this score differed significantly from people's typical perception of what "neutral" should represent.

The method used to calculate ACCI in this study applies the same approach as the Korea Consumer Agency's method, as shown in Equation 1 below:

$$\text{Scores for each category} = \frac{1}{n}\sum_{i=1}^{n} 20 \times X_i \qquad (1)$$

Where $n$ is the number of questions, and $X_i$ represents respondent $i$'s response value on the 5-point Likert scale. For example, in the "use of labels" category of the food selection stage, if a respondent's total score for all 8 questions is 40 (the maximum possible score), their competency score for food labeling usage would be 100 points. If the total score is 24, the resulting competency score would be 60 points.

However, this study does not apply weights to different competency categories, unlike the Korea Consumer Agency's CCI, which incorporates weights for each stage and includes binary variables such as true/false or yes/no questions. Therefore, it is important to note that while the method used in this study is based on the Korea Consumer Agency's approach, it is not identical.

### 2.3. Complex Sample Design

According to the use guide for raw data of the CBSF, the survey employs a complex sample design, which incorporates stratification, clustering, and weighting. The basic sampling units in the survey are clusters (such as enumeration districts, aggregation districts, or apartment complexes) and households within these clusters. The primary food purchaser, adult household members, and adolescent household members serve as separate analytical units. For each survey unit, a sample weight is calculated to represent the target population, allowing for the use of appropriate statistical analyses. Most parameters obtained through the FCBS are calculated based on the total estimator (Equation 2) as described in Lee et al. (2021).

$$\hat{Y} = \sum_{h=1}^{H}\sum_{i=1}^{n_h}\sum_{k=1}^{m_{hi}} w_{hik} y_{hik} \qquad (2)$$

In this equation, $w_{hik}$ and $y_{hik}$ refer to the sample weight and the survey value of the $k$-th sample respondent from the $i$-th cluster in the $h$-th stratum, respectively. The total number of strata is represented by $H$, $n_h$ represents the number of clusters in stratum $h$, and $m_{hi}$ is the number of sample respondents in cluster $i$.

When analyzing data collected through complex sample designs, it is critical to account for stratification, multi-stage sampling, and weighting in both parameter estimation and the calculation of standard errors. Ignoring the complex sample design and treating the data as a simple random sample can lead to underestimation of standard errors, resulting in overestimated precision of the estimates (Lee, 2016).

For the analysis in this study, the general linear model (GLM) was employed, which is commonly used in complex sample analyses when the dependent variable is continuous. This model assumes a linear regression for errors and means, and incorporates information from the complex sample design to estimate regression coefficients and test model effects. The parameter vector $\beta$ is estimated through least squares estimation. While various methods, such as the Taylor Series, Balanced Repeated Replication (BRR), and Jackknife methods, can be used to estimate variance, the most commonly used method for estimating the covariance matrix of regression coefficients is the Taylor Series linearization method (Kim & Kim, 2017).

## 3. Analysis Results

### 3.1. ACCI Analysis

#### 3.1.1. Descriptive statistics

Table 2 presents the descriptive statistics of ACCI for 2016 and 2021. First, a comparison was made between the index in 2016, when the related questions were first included in the survey, and 2021. The average ACCI score in 2016 was 71.2 points, and by 2021, it had increased by 0.78 points to 72.0 points. While it may be difficult to determine the qualitative significance of a score of 72, it can be seen as a reasonable level when compared to the Korea Consumer Agency's CCI, which scored 65.5 points (out of 100) in 2018. This difference may be attributed to the fact that the Korea Consumer Agency's index includes more challenging questions, such as true/false quizzes in the knowledge section, whereas ACCI is more focused on practical topics

closely related to everyday food choices, preparation, and consumption, making it easier for respondents to answer.

In both 2016 and 2021, women consistently scored higher than men on ACCI. However, between 2016 and 2021, ACCI for men increased by 1.07 points, compared to a smaller increase of 0.48 points for women. By age group, the index for respondents in their 30s and 40s actually decreased in 2021 compared to 2016. By region, decreases were observed in regions such as Chungcheong and Daegu-Gyeongbuk. Notably, respondents with lower educational attainment (middle school or lower) saw a relatively large increase of 2.4 points, while single-person households (2.25 points) and those with an income below 2 million KRW (3.11 points) also showed significant increases.

Looking at ACCI by demographic categories, respondents in their 50s had the highest average score at 72.87 points, followed by those in their 40s (72.63 points). The lowest score was observed among respondents in their 20s, with an average of 71.19 points. By region, the Capital region (Seoul metropolitan area) had the highest average score at 72.62 points, while the Gangwon region had the lowest at 66.38 points. The Busan-Gyeongnam region saw a notable increase, rising from 69.56 points in 2016 to 72.67 points in 2021, an increase of 3.11 points.

Respondents with higher levels of education had higher competency scores. Those with a college degree or higher had an average score of 72.5 points, while respondents with a middle school education or lower had a score of 71.16 points. When analyzed by monthly household income, respondents with incomes between 5 million and 6 million KRW and those with incomes above 6 million KRW both scored over 72.7 points, while those with incomes between 4 million and 5 million KRW scored 72.46 points. This trend of higher ACCI scores among higher-income groups is consistent with findings by Yoo et al. (2018), who explained that "groups with more education are more likely to be exposed to consumer education, and higher income and older age groups have more diverse consumer experiences in modern society," emphasizing the influence of consumer education and experience. In terms of housing type, consumers living in apartments had an average ACCI score of 72.68 points, while those living in multiplex housing and detached house scored lower, with averages of 71.41 points and 71.12 points, respectively.

**Table 2:** Descriptive Statistics (2016 and 2021)

| Category | | 2016(A) | | | 2021(B) | | | Diff. (B-A) |
|---|---|---|---|---|---|---|---|---|
| | | Mean | Standard Deviation | Weighted N | Mean | Standard Deviation | Weighted N | |
| Total | | 71.22 | 7.56 | 41,432,135 | 72.00 | 7.51 | 41,102,003 | 0.78 |
| Gender | Male | 70.53 | 7.61 | 20,495,303 | 71.60 | 7.72 | 20,053,138 | 1.07 |
| | Female | 71.90 | 7.45 | 20,936,832 | 72.38 | 7.28 | 21,048,865 | 0.48 |
| Age | 20s | 70.37 | 7.76 | 6,744,436 | 71.19 | 7.79 | 6,613,796 | 0.82 |
| | 30s | 72.05 | 7.38 | 8,245,402 | 71.66 | 7.55 | 6,664,028 | -0.39 |
| | 40s | 73.16 | 7.50 | 8,399,979 | 72.63 | 7.22 | 7,967,162 | -0.53 |
| | 50s | 71.44 | 7.22 | 8,223,311 | 72.87 | 7.30 | 8,334,890 | 1.43 |
| | 60s | 69.88 | 7.02 | 5,157,081 | 71.78 | 7.60 | 6,462,760 | 1.90 |
| | 70+ | 68.59 | 7.66 | 4,661,926 | 71.35 | 7.54 | 5,059,368 | 2.76 |
| Region | Capital | 72.14 | 7.37 | 20,600,077 | 72.62 | 7.31 | 20,620,807 | 0.48 |
| | Chungcheong | 72.09 | 7.48 | 4,404,959 | 71.70 | 8.56 | 4,389,206 | -0.39 |
| | Honam | 70.27 | 8.54 | 4,534,310 | 71.38 | 7.98 | 4,527,058 | 1.11 |
| | Daegu-Gyeongbuk | 71.29 | 6.40 | 4,341,241 | 70.53 | 5.84 | 4,067,447 | -0.76 |
| | Busan-Gyeongnam | 69.56 | 6.93 | 6,304,574 | 72.67 | 7.19 | 6,262,673 | 3.11 |
| | Gangwon | 64.60 | 8.75 | 1,246,974 | 66.38 | 8.19 | 1,234,813 | 1.78 |
| Urban /Rural | Urban | 71.73 | 7.52 | 34,568,834 | 72.36 | 7.53 | 33,947,480 | 0.63 |
| | Rural | 68.67 | 7.26 | 6,863,301 | 70.27 | 7.15 | 7,154,523 | 1.60 |
| Education level | Middle school or lower | 68.76 | 7.49 | 8,209,797 | 71.16 | 7.58 | 6,459,594 | 2.40 |
| | High school | 71.25 | 7.45 | 17,028,345 | 71.77 | 7.49 | 16,384,310 | 0.52 |
| | College degree or higher | 72.44 | 7.41 | 16,193,993 | 72.50 | 7.46 | 18,258,099 | 0.06 |
| Household type | Multi-person | 71.63 | 7.49 | 34,931,069 | 72.16 | 7.39 | 33,451,715 | 0.53 |
| | Single-person | 69.03 | 7.56 | 6,501,066 | 71.28 | 7.99 | 7,650,289 | 2.25 |
| Monthly | Below 2 million | 68.00 | 7.47 | 8,345,687 | 71.11 | 7.52 | 5,641,886 | 3.11 |

| Category | | 2016(A) | | | 2021(B) | | | Diff. (B-A) |
|---|---|---|---|---|---|---|---|---|
| | | Mean | Standard Deviation | Weighted N | Mean | Standard Deviation | Weighted N | |
| household income (KRW) | 2-3 million | 70.66 | 7.14 | 7,645,181 | 70.88 | 7.92 | 6,486,391 | 0.22 |
| | 3-4 million | 71.78 | 7.12 | 9,235,706 | 71.59 | 7.52 | 6,082,859 | -0.19 |
| | 4-5 million | 72.34 | 7.46 | 7,516,190 | 72.46 | 7.54 | 6,296,151 | 0.12 |
| | 5-6 million | 72.94 | 7.40 | 5,587,762 | 72.73 | 7.23 | 7,389,359 | -0.21 |
| | Above 6 million | 73.80 | 7.64 | 3,101,610 | 72.70 | 7.22 | 9,205,357 | -1.10 |
| Housing type | Apartment | 72.30 | 7.39 | 22,923,717 | 72.68 | 7.63 | 21,771,411 | 0.38 |
| | Multiplex | 71.28 | 7.86 | 7,894,378 | 71.41 | 7.43 | 8,749,775 | 0.13 |
| | Detached house | 68.89 | 7.24 | 10,071,676 | 71.12 | 7.18 | 10,357,400 | 2.23 |
| | Others | 68.08 | 5.08 | 542,364 | 69.49 | 7.71 | 223,418 | 1.41 |

### 3.1.2. Evaluation of factors affecting ACCI

To analyze the factors influencing ACCI, the following Equation 3 was established. Since the tools for enhancing consumer competency in food consumption focus on consumer education and promotional events, whether or not respondents received food-related education was included as a key variable of interest.

$$ACCI_i = \alpha + \sum_{p=1}^{m} \beta_p D_{pi} + \sum_{q=1}^{k} \theta_q x_{qi} + u_i \qquad (3)$$

Here, $D$ is a dummy variable indicating whether the respondent received food-related education (1 for yes, 0 for no). Many countries are implementing food-related educations to improve their citizens' dietary habits. This education is a highly acceptable policy, as it avoids imposing regulations on the food industry while simultaneously receiving broad social support (Traill et al., 2013; Aschemann-Witzel et al., 2016). For this reason, food-related education is considered a cost-effective and profitable investment (Dollahite et al., 2008). The CBSF categorizes food-related education into three types: i) consumer education about food, ii) government-sponsored food promotion events, and iii) food-related events organized by consumer groups, each represented by a separate dummy variable from $D_1$ to $D_3$. $x$ includes the demographic variables used in previous studies, $u$ is the error term, and the subscript $i$ represents individual consumers.

Table 3 presents the results of the analysis. Models (1) and (2) estimate the total score as the dependent variable, with the main difference being whether or not complex sample analysis was applied. Specifically, Model (2) incorporates complex sample analysis. Models (3), (4), and (5) use the sub-indexes for *food selection stage*, *cooking and consumption stage,* and *consumer rights and responsibilities stage*, which were presented in Table 1, as the dependent variables.

The results show that the coefficients in Model (1) tend to be overestimated compared to Model (2), with smaller standard errors, resulting in some variables being reported as significant in Model (1) that are not significant in Model (2). For example, being the primary food purchaser is not statistically significant in Model (2) after accounting for the complex sample design. This highlights the importance of using complex sample analysis when dealing with data like this survey to avoid incorrect inferences.

Focusing on Model (2), respondents with consumer education experience scored an average of 1.5 points higher on the total ACCI score. Those with experience in consumer group events scored approximately 1.7 points higher. Although experience with government-sponsored promotional events had a positive association, it was not statistically significant. These findings suggested that the higher scores in the "*cooking and consumption stage*" observed in Model (4) could be attributable to consumer education and consumer group events. Respondents with consumer education experience showed a statistically significant increase of about 2 points in the "*cooking and consumption stage*," and those with experience in consumer group events scored about 2.4 points higher. Government-public events did not show a significant relationship with any competency index; in fact, the analysis revealed a negative association in the "*cooking and Consumption stage*," indicating the possibility that incorrect messages might have been conveyed to consumers.

In summary, consumer education and consumer group events were associated with higher scores in "*cooking and consumption stage*," leading to an overall increase in ACCI. Additionally, while other competency scores were not statistically significant, they all had positive associations, suggesting that consumer education and group events could be effective tools for enhancing consumer competency. These findings are consistent with prior research on the effects of education in general consumer fields. Park (2018) found that consumer education through home economics courses effectively improved both the cognitive and

practical consumer competencies of middle school students. Even two months after completing the education, follow-up evaluations showed that cognitive competency was sustained. Similarly, Park and Jung (2020) confirmed the effectiveness of consumer education through meta-analysis, particularly showing that the impact of education is greater for younger age groups.

However, it is important to note that selection bias may exist, as consumers can choose whether or not to participate in education. Consequently, the estimated coefficients should not be interpreted as causal effects.

Next, we examine the results for the other variables. Compared to the results in Table 2, these findings indicate the net effect while holding other variables constant, thereby providing a distinct advantage by allowing reference to statistical significance. ACCI is higher for women than for men, with the gap being most pronounced in '*food selection stage*' scores. As age increases, so does the score. Whether or not the respondent is the primary food purchaser (typically a homemaker) or is married was not statistically significant.

Living in rural areas (eup/myeon regions) results in a total competency score about 1.5 points lower than for those living in urban areas (dong regions), with significant differences observed in '*food selection stage*' and '*cooking and consumption stage*' scores. Education level was also significant; respondents with a college degree or higher scored 0.8 points higher on the total score, 1.2 points higher in '*food selection stage*,' and 0.9 points higher in '*consumer rights and responsibilities stage*' compared to those with less education. The difference between single-person households and multi-person households was not statistically significant.

Monthly household income showed a positive correlation with the total score and all sub-index scores. Generally, consumers with higher education and income levels are more inclined to pursue well-being (Chung & Hwang, 2016). This suggests a likely significant relationship between well-being and ACCI. The regional dummy variable analysis showed that the competency scores in the Daegu-Gyeongbuk and Gangwon regions were statistically significantly lower than in the Capital region. In particular, Gangwon scored 5.4 points lower in total and 7.4 points lower in '*food selection stage*,' indicating a need for improvements in food selection environments and intervention through educational programs.

Finally, regarding housing type, consumers living in non-apartment dwellings scored lower on all competency indexes compared to those living in apartments.

**Table 3:** Analysis Results of ACCI

| Category | | (1) Total Score | (2) Total Score | (3) Food Selection | (4) Cooking and Consumption | (5) Consumer Rights and Responsibilities |
|---|---|---|---|---|---|---|
| Complex sample analysis | | × | ○ | ○ | ○ | ○ |
| Consumer education (Experienced = 1) | | 1.975** (0.841) | 1.506* (0.894) | 1.319 (1.068) | 2.014* (1.153) | 1.217 (0.887) |
| Government public relations event (Experienced = 1) | | 0.576 (1.006) | 0.415 (1.228) | 1.280 (1.426) | -0.340 (1.447) | 0.315 (1.132) |
| Consumer group event (Experienced = 1) | | 2.213*** (0.842) | 1.688* (0.999) | 1.600 (1.138) | 2.392** (1.167) | 1.134 (1.022) |
| Gender (Male = 1, Female = 2) | | 0.918*** (0.188) | 0.960*** (0.205) | 1.360*** (0.268) | 0.946*** (0.233) | 0.613*** (0.222) |
| Age (19–74 years) | | 0.0361*** (0.00936) | 0.0387** (0.0156) | -0.00244 (0.0187) | 0.0785*** (0.0163) | 0.0398** (0.0163) |
| Primary buyer status (Primary buyer = 1) | | 0.556*** (0.214) | 0.0773 (0.471) | 0.142 (0.524) | 0.142 (0.483) | -0.0391 (0.497) |
| Marital status (Married = 1) | | 0.158 (0.307) | 0.206 (0.493) | 0.200 (0.586) | 0.505 (0.510) | -0.0590 (0.525) |
| Urban/Rural (Urban = 1, Rural = 2) | | -0.615** (0.253) | -1.451* (0.777) | -1.627* (0.871) | -1.490* (0.804) | -1.257 (0.801) |
| Education level (College degree or higher = 1) | | 1.045*** (0.212) | 0.847** (0.334) | 1.221*** (0.361) | 0.455 (0.372) | 0.863** (0.350) |
| Single-person household (Single-person = 1) | | -0.361 (0.381) | 0.113 (0.632) | 0.465 (0.716) | -0.837 (0.694) | 0.651 (0.684) |
| Monthly household income (1) Below 2 million won ~ (6) Above 6 million won | | 0.293*** (0.0707) | 0.337** (0.153) | 0.333* (0.170) | 0.274* (0.163) | 0.396** (0.162) |
| Region (Reference = Capital) | Chungcheong | -0.997*** (0.304) | -0.246 (1.094) | -0.853 (1.128) | 1.917** (0.953) | -1.647 (1.306) |
| | Honam | 0.167 (0.297) | -0.640 (0.863) | -0.355 (0.892) | -0.376 (0.888) | -1.133 (0.938) |

| Category | | (1) Total Score | (2) Total Score | (3) Food Selection | (4) Cooking and Consumption | (5) Consumer Rights and Responsibilities |
|---|---|---|---|---|---|---|
| | Daegu-Gyeongbuk | -1.359*** (0.306) | -1.522** (0.678) | -2.001*** (0.731) | -0.738 (0.771) | -1.796*** (0.684) |
| | Busan-Gyeongnam | 0.840*** (0.287) | 0.725 (0.833) | 0.294 (0.956) | 0.976 (0.840) | 0.887 (0.834) |
| | Gangwon | -4.102*** (0.512) | -5.410*** (1.140) | -7.359*** (1.216) | -5.044*** (1.236) | -3.985*** (1.185) |
| Housing type (Reference = Apartment) | Multiplex | -1.561*** (0.263) | -1.356* (0.700) | -0.882 (0.724) | -1.915** (0.745) | -1.279* (0.713) |
| | Detached house | -1.150*** (0.233) | -0.723 (0.659) | -0.698 (0.684) | -0.860 (0.703) | -0.621 (0.688) |
| | Others | -3.865*** (1.414) | -3.845* (2.251) | -3.458 (2.145) | -3.519 (2.410) | -4.487* (2.436) |
| Constant | | 68.64*** (0.715) | 69.28*** (1.566) | 70.15*** (1.829) | 68.67*** (1.594) | 69.04*** (1.597) |
| Observations | | 6,355 | 6,355 | 6,355 | 6,355 | 6,355 |
| R-squared | | 0.053 | 0.056 | 0.063 | 0.068 | 0.043 |

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

## 3.2. Analysis of Consumer Competency Types

### 3.2.1. Latent Class Analysis

In the next step, we categorized consumers based on their ACCI to identify distinct consumer groups and understand their characteristics. This is expected to help prioritize target groups for dietary education policies and assist in planning and targeting appropriate groups.

The LCA is a statistical clustering method used to classify individuals into homogeneous subgroups, conceptually similar to factor analysis (Goodman, 1974). LCA is widely recognized as a useful method for analyzing differences between classes by estimating the probability of individuals belonging to certain latent classes based on their response patterns. Unlike traditional clustering methods, where the number of clusters must be arbitrarily set by the researcher, LCA estimates latent classes from the data pattern itself, minimizing errors that may arise from arbitrarily determining the number of groups (Cho & Lee, 2019).

LCA classifies individuals into latent classes based on the likelihood of their responses and assigns them to the latent class with the highest probability. The probability of observing response patterns $Y_i = (Y_{i1}, Y_{i2}, ..., Y_{ij})$ for individual $i$ is expressed as Equation 4:

$$P(Y_i) = \sum_{L=1}^{C} \gamma L \prod_{j=1}^{J} P(Y_{ij} | L) \quad (4)$$

where $P(Y_i)$ is the probability of observing the response pattern of indivisual $i$, $\gamma L$ is the probability that indivisual $i$ belong to latent class $L$, $P(Y_{ij}|L)$ is the conditional probability that indivisual $i$ responds to item $j$ given membership in latent class $L$. At this point, the probability of belonging to a latent class and the conditional probability are estimated using the Maximum Likelihood Estimation (MLE) method, which enables the classification of individual respondents into the most appropriate latent class. The likelihood function for respondent $N$ is shown in Equation 5 below.

$$L(\gamma, P) = \prod_{i=1}^{N} \sum_{L=1}^{C} \gamma L \prod_{j=1}^{J} P(Y_{ij} | L) \quad (5)$$

where $L(\gamma, P)$ is the likelihood function that represents the probability of the observed data for all respondents, $N$ is the total number of respondents, $\gamma L$ is the probability of membership in latent class $L$ and $P(Y_{ij}|L)$ is the probability of observing response $Y_{ij}$ given membership in class $L$.

We utilized the nine category scores that comprise ACCI by converting them into binary variables, based on a threshold of 80 points. Here, 80 points correspond to 'Agree' (=4) on a 5-point scale, serving as an absolute standard for distinguishing between high and low consumer competency.

### 3.2.2. Results of Latent Class Analysis

To determine the optimal number of latent classes in LCA, information criteria such as the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are commonly utilized. Typically, AIC has a limitation in that it exhibits asymptotic consistency based on sample size, leading to a preference for BIC in most studies (Koo & Lee, 2011; Choi & Bang, 2017; Seol & Heo, 2022). Additionally, the entropy index, which summarizes the overall accuracy of latent class classification, measures classification quality. It ranges from 0 to 1, where values closer to 0 indicate poorer separation of latent classes. A value below 0.6 implies roughly 20% misclassification, while a value of 0.8 indicates over 90% correct classification (Oh & Cha, 2018).

Table 4 presents the changes in analysis indicators according to the number of classes, with three classes identified as optimal in this study. Both AIC and BIC decrease substantially with three classes compared to two but show only a gradual decline from four classes onward, while the entropy index drops to approximately 0.6 at four classes. When the number of classes is set to three, the classification rates are 16.7%, 54.1%, and 29.1%, respectively.

Figure 1 illustrates the probability of achieving high scores (over 80 points) in each competency based on the three-class model identified as optimal. The class comprising 16.7% of the total, labeled as the high competency class, showed high probabilities across all competency areas. Similarly, class (2) was labeled as the low competency class, and class (3) as the moderate competency class. In Figure 1, consumers in the high competency class have a 75% probability of scoring high in use of label competency, whereas this probability drops to 26% for the moderate competency class and a mere 4% for the low competency class. In the CBSF, the purchasing environment competency, representing the physical and economic accessibility of food, has only an 8% probability of being high in the low competency class.

Examining the characteristics of each named class based on the classification results reveals that, with respect to ACCI in Korea, the low competency class comprises the largest proportion of consumers at 54.1%, followed by the moderate competency class at 29.1% and the high competency class at 16.7%. This indicates that over half of adult consumers fall into the low competency class.

### 3.2.3. Demographics by Consumer Competency Type

Lastly, after estimating the population distribution for each class using complex sample analysis, we examined the

**Table 4:** Indicators According to the Number of Classes

| Category | | number of classes | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 3 | 4 | 5 | 6 |
| cases | | 6355 | 6355 | 6355 | 6355 | 6355 |
| df | | 492 | 482 | 472 | 462 | 452 |
| Log-likelihood | | -25809 | -25269 | -25158 | -25074 | -25030 |
| AIC | | 51656 | 50595 | 50395 | 50246 | 50177 |
| BIC | | 51784 | 50791 | 50658 | 50577 | 50576 |
| Entropy | | 0.882 | 0.744 | 0.670 | 0.659 | 0.634 |
| Classification rates (%) | Class 1 | 0.700 | 0.167 | 0.065 | 0.071 | 0.089 |
| | Class 2 | 0.300 | 0.541 | 0.322 | 0.244 | 0.423 |
| | Class 3 | | 0.291 | 0.203 | 0.194 | 0.221 |
| | Class 4 | | | 0.410 | 0.430 | 0.054 |
| | Class 5 | | | | 0.062 | 0.067 |
| | Class 6 | | | | | 0.146 |

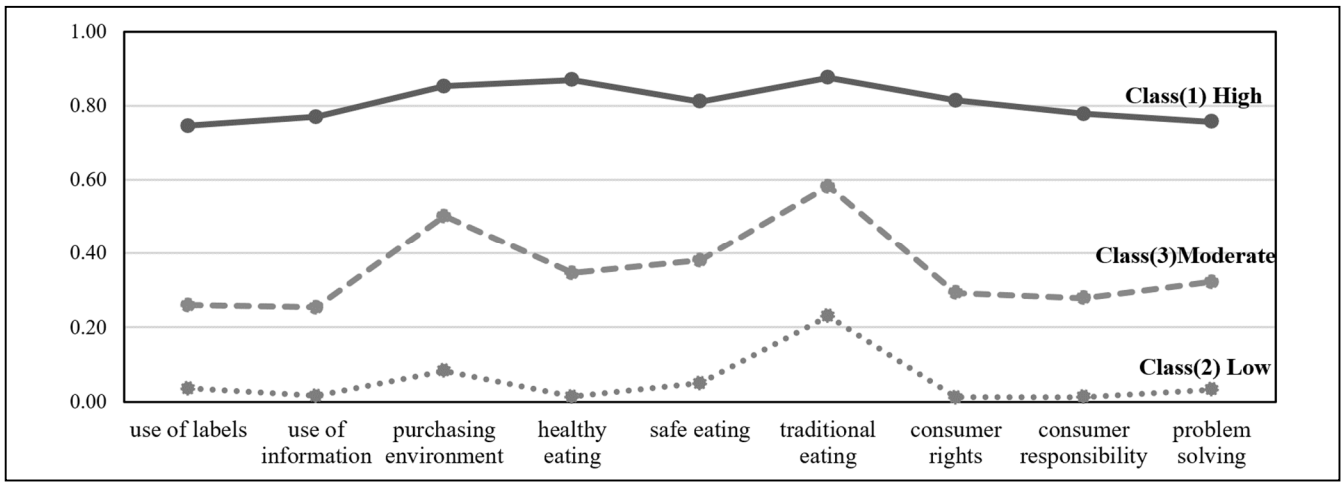


**Figure 1:** Probability by three-class

demographic characteristics of the classes. When applying complex sample analysis, it is estimated that 57.5% of the adult population, or approximately 23.65 million people, belong to the low competency group. The moderate competency group accounts for 25.7%, or 10.55 million people, and the high competency group accounts for 16.8%, or 6.9 million people. The average ACCI scores for the high, low, and moderate competency groups are 82.9, 67.3, and 75.3, respectively. The moderate group's score is over 3 points higher than the overall average score of 72, while the high group's score is more than 10 points above average. These findings suggest that government efforts in dietary education should prioritize the low competency group over the high competency group.

56.1% of the population in metropolitan areas belongs to the low competency group, while in other areas, the percentage rises to 58.7%. By region, the low competency group is more prevalent in Gangwon (67.4%), Daegu-Gyeongbuk (66.8%), and Chungcheong (60.7%) regions. The proportion of the low competency group is higher in rural areas at 65.7%, compared to 55.8% in urban areas. Therefore, regional educational planning should consider these differences.

By housing type, the low competency group is more prevalent among residents of multiplex housing (62.8%) and detached house (61.7%), suggesting that education programs should focus more on areas with concentrated multiplex and detached housing rather than apartment complexes.

Regarding gender, men are more likely to belong to the low competency group than women. By age group, the proportion of the low competency group forms a U-shape, with a lower percentage in the 40s and 50s. The proportion of the low competency group is 60.5% for those in their 20s and 62.5% for those in their 70s, indicating a need for education in these age groups.

**Table 5:** Demographics by Consumer Competency Types (%)

| Category | | High | Low | Moderate | Category | | High | Low | Moderate |
|---|---|---|---|---|---|---|---|---|---|
| Total | | 16.8 | 57.5 | 25.7 | Occupation | Managers | 20.0 | 45.9 | 34.1 |
| Residential Area | Metropolitan Area | 17.8 | 56.1 | 26.0 | | Professionals | 20.4 | 50.3 | 29.3 |
| | Other | 16.0 | 58.7 | 25.4 | | Office Workers | 17.7 | 53.6 | 28.7 |
| Region | Capital | 17.3 | 55.7 | 27.0 | | Service Workers | 15.7 | 56.9 | 27.3 |
| | Chungcheong | 23.2 | 60.7 | 16.1 | | Sales Workers | 15.7 | 62.3 | 22.0 |
| | Honam | 17.9 | 51.2 | 30.9 | | Agriculture, Forestry, Fisheries | 9.5 | 63.0 | 27.5 |
| | Daegu-Gyeongbuk | 5.4 | 66.8 | 27.7 | | Technicians | 17.2 | 61.6 | 21.2 |
| | Busan-Gyeongnam | 19.3 | 57.9 | 22.9 | | Machine Operators | 17.0 | 62.5 | 20.6 |
| | Gangwon | 6.5 | 67.4 | 26.1 | | Homemakers | 18.7 | 58.9 | 22.4 |
| Urban / Rural | Urban | 17.9 | 55.8 | 26.3 | | soldier | 12.7 | 71.6 | 15.7 |
| | Rural | 11.6 | 65.7 | 22.6 | | University/ Graduate Students | 12.9 | 62.5 | 24.6 |
| Housing Type | Apartment | 20.2 | 53.3 | 26.5 | | Unemployed | 11.5 | 66.5 | 21.9 |
| | Multiplex Housing | 13.2 | 62.8 | 23.9 | Monthly Household Income (KRW) | Below 2 Million | 15.2 | 60.7 | 24.2 |
| | Detached House | 12.8 | 61.7 | 25.5 | | 2-3 Million | 15.6 | 61.6 | 22.8 |
| | Other | 5.9 | 72.1 | 22.0 | | 3-4 Million | 15.4 | 60.3 | 24.3 |
| Gender | Male | 15.7 | 58.0 | 26.4 | | 4-5 Million | 19.0 | 57.1 | 23.9 |
| | Female | 17.9 | 57.1 | 25.0 | | 5-6 Million | 17.1 | 55.0 | 27.9 |
| Age | 20s | 13.5 | 60.5 | 25.9 | | Above 6 Million | 17.8 | 53.4 | 28.9 |
| | 30s | 15.5 | 57.9 | 26.6 | SNS Usage | Never use | 19.8 | 55.4 | 24.8 |
| | 40s | 18.3 | 54.3 | 27.4 | | occasionally use | 14.0 | 60.1 | 25.8 |
| | 50s | 20.0 | 54.7 | 25.3 | | Frequently use | 18.6 | 54.1 | 27.3 |
| | 60s | 16.9 | 57.8 | 25.3 | Food-related TV/Media | Never watch | 13.6 | 61.9 | 24.5 |
| | 70+ | 15.1 | 62.5 | 22.4 | | Occasionally watch | 15.6 | 60.0 | 24.4 |
| Household Type | Multi-person | 16.9 | 57.5 | 25.6 | | Frequently watch | 25.5 | 42.6 | 31.9 |
| | Single-person | 16.3 | 57.7 | 26.0 | Consumer Education | Experienced | 26.1 | 35.8 | 38.0 |
| Education Level | Not attended school | 4.9 | 71.7 | 23.4 | | Not experienced | 16.6 | 58.0 | 25.4 |
| | Middle school graduate or below | 14.2 | 61.3 | 24.5 | Government Public Relations Events | Experienced | 24.6 | 43.1 | 32.2 |
| | High school graduate | 16.3 | 59.5 | 24.2 | | Not experienced | 16.7 | 57.7 | 25.6 |
| | College graduate | 18.2 | 54.3 | 27.5 | Consumer Group Events | Experienced | 31.4 | 37.0 | 31.6 |
| | Graduate school graduate | 33.3 | 42.0 | 24.7 | | Not experienced | 16.5 | 58.0 | 25.5 |

Note: Totals are recalculated to equal 100% horizontally based on the estimated population.

There is no significant difference between one-person and multi-person households. However, educational attainment shows a linear relationship, indicating that consumers with lower educational levels require more attention in education programs.

By occupation, the low competency group is prevalent among soldiers (71.6%), agricultural/forestry/fishery workers (63.0%), and students (62.5%), suggesting that targeted education for specific occupational groups could be effective.

In terms of income, households with a monthly income of less than 4 million KRW have more than 60% of their members in the low competency group, which should be considered when formulating policies.

For remote education, TV or other media forms may be more effective than social media (SNS). The low competency group has the highest percentage (60.1%) of respondents who "occasionally use" SNS, and the high competency group has the highest percentage (19.8%) of respondents who "never use" SNS. On the other hand, 61.9% of the low competency group reported that they "never watch" food-related TV or media, while 25.5% of the high competency group reported that they "frequently watch" such content, indicating a potential correlation between media consumption and competency levels.

## 4. Summary and Conclusion

The Framework Act on Consumers highlights the dual objective of protecting consumers and enhancing their capacity to exercise autonomous rights. In 2007, the Consumer Competency Index (CCI) was developed to assess consumer competency, and in 2014, the Agri-food Consumer Competency Index (ACCI) was introduced specifically for the agri-food sector.

This study aimed to calculate ACCI, analyze its influencing factors, and classify consumer groups to propose directions for dietary education. Using data from the KREI's Consumer Behavior Survey for Food (CBSF), this study evaluated the level of consumer competency and its determinants, and through Latent Class Analysis (LCA), categorized consumers based on their dietary competencies.

The main findings of the study are summarized as follows. First, in 2021, ACCI in Korea was 72.0 out of 100, showing an increase of 0.78 points compared to 2016. This score appears reasonable when compared to the Korea Consumer Agency's CCI, which scored 65.5 points in 2018, covering areas such as financial competency, transaction competency, and civic competency. Second, significant differences were found in ACCI based on gender, age, region, urban-rural area, education level, income, and housing type. Women scored higher than men, and those in their 50s scored the highest, while those in their 20s scored the lowest. The capital region scored the highest, while the Gangwon region scored the lowest, with a difference of more than six points. Urban areas and multi-person households scored two points and 1.8 points higher, respectively, compared to rural areas and one-person households. The higher the education and household income, the higher the competency index score. Third, a complex-sample regression analysis was conducted with consumer education and promotional events as key variables. The results show that consumer education experience scored about 1.5 points higher. Those with experience in consumer group events scored about 1.7 points higher. Although experience with government public relations events had a positive influence, it was not statistically significant at any conventional level. Fourth, using LCA, consumers were categorized into three groups. The results showed that the low competency group accounted for the largest proportion at 57.5%, followed by the moderate competency group at 25.7%, and the high competency group at 16.8%. This indicates that more than half of adult consumers fell into the low competency category.

This study is meaningful as it provides an overview of agri-food consumer competency in Korea, examines the influence of dietary education on this competency, and identify priority groups for targeted dietary education policies. The conclusions drawn from this study are as follows. First, although ACCI in Korea is 72.0 out of 100, which is not an absolutely low level, the fact that more than half of adults belong to the low competency group indicates the need for policy intervention. Second, consumer education and consumer group events were shown to be effective tools for enhancing consumer competency. However, government public events were not statistically significant, suggesting that direct consumer education and events organized by consumer groups are more effective in strengthening competency. Third, it is advisable to prioritize consumer education programs targeting rural areas, multiplex/detached housing residents, low-education consumers, and households with a monthly income of less than 4 million KRW. Education programs should focus on rural areas, soldiers, agricultural/forestry/fishery workers, and students. Additionally, remote education may be more effective through TV and media rather than social media platforms (SNS).

The Korean Government's consumer education programs largely depend on outsourcing to private institutions. The findings of this study are anticipated to improve policy effectiveness and create new business opportunities for private education providers. However, this study has certain limitations due to the use of survey data, which may not fully address endogeneity issues.

Consequently, the relationship between consumer education and the enhancement of consumer competency should not be interpreted as causal. Additionally, in calculating ACCI, equal importance was assumed for each stage and category of competency. For future refinements of the index, it would be preferable to assign weights according to the relative importance of each category. Therefore, to develop a more sophisticated ACCI, incorporating a weighting process with expert input is recommended.

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