# Household Food Security: Evaluation of Influential Variables Using Exploratory Factor Analysis

Jelita[1*], Budi Irwansyah[2], Lilla Puji Lestari[3], Satya Darmayani[4], Faidliyah Nilna Minah[5]

*[1,2] IAIN Langsa, Aceh, Indonesia*
*[3] Universitas Maarif Hasyim Latif, Sidoarjo, Indonesia*
*[4] Health Polytechnic of Kendari*
*[5] Institut Teknologi Nasional Malang, Indonesia*

*[*]Email: jelita@iainlangsa.ac.id*

*Abstract*

*Understanding the patterns that influence food security is very important. Deconstructing food security assessment into clearly defined variables might enhance its effectiveness. Efforts to improve food security measurements are generally prioritized on the most visible, objectively measurable, and familiar dimensions. In reality, there is sometimes confusion regarding which components of the food security definition a metrics is assessing, leading to the interchangeable use of indicators for distinct food security dimensions. Identifying, studying, and understanding these determining factors is the first step in exploring government policies and strategies to reduce food insecurity in any development. This study aims to analyze and identify factors that have been identified through literature, questionnaire-based surveys, and exploratory factor analysis approaches for their ranking. The literature identifies fifteen variables that influence the household food security. From these variables, four elements were taken. The results show that the household food security in East Langsa is influenced by the household debt (28.283%); distance to the market (11.943%); age of the head of household (7.8%); and transportation costs (6.678%). The findings of this study can be a reference point for future research that aims to understand the impact of these four dimensions on household food security.*

*Keywords: Food Security, Household, Exploratory Factor Analysis Approach*

## I. INTRODUCTION

The Governments of Spain, the United States of America, the African Union, the European Union, Colombia, Germany, Indonesia, and Nigeria, convened on September 20, 2022, and express their dedication to promptly and comprehensively address the critical global food security and nutrition requirements affecting hundreds of millions of individuals. The current state of food systems and global food security is highly crucial. The confluence of a worldwide pandemic, escalating pressures stemming from the climate catastrophe, elevated energy and fertilizer costs, and prolonged wars, has caused significant discruptions to production and supply systems, resulting in a substantial rise in global food insecurity. Food is a fundamental human right that is needed by everyone in the world, regardless of gender, male or female, food needs must be sufficient and are very basic for the development of a country. Food is an essential requirement for life and must be fulfilled prior to addressing any other developmental concerns. In several civilizations, inadequate nutrition is regarded as an indicator of poverty or is synonymous with poverty [1]. [2] It is important to recognize that food security is crucial for maintaining political stability and promoting peaceful cohabitation among people. On the other hand, food insecurity leads to negative impacts on the health and performance of both children and adults. According to [3], food security is an essential foundation for development. [4] argues that "food security and poverty are still the main problems and challenges in a country's development." From this, it is evident that food security is a crucial factor in regional development, as indicated by several significant factors, including the augmentation of food production, fast access to food distribution, and the availability of safe and nutritious food consumption for all levels of society [5]. Food security refers to the condition in which all individuals have continuous and unrestricted availability to a

sufficient quantity of safe and nourishing food that meets their dietary needs and tastes, allowing them to maintain optimal health and a physically active lifestyle (Food and Agricultural Organization, 1996).

According to the definition of food security stated in Law No. 7 of 1996, four requirements must be met in order to achieve food security. These requirements are: a) sufficient availability of food, b) consistent availability of food without seasonal or yearly fluctuations, c) accessibility and affordability of food, and d) ensuring the quality and safety of food. These four components are utilized to assess food security at the household level. The four indications mentioned are the primary factors used to calculate a food security index. A household may be described as a collective of persons who actively contribute to and collectively rely on a shared economic resource base, primarily deriving their sustenance from the revenue generated by this basis [6]. Household type can be categorized as either market-food-oriented or non-market-food-oriented. Market-food-oriented households primarily obtain the majority of their food via exchanging resources such as money, services, or items. A household that is not focused on market activities obtains the majority of its food by producing it at home. Household type can also be delineated by factors such as income sources, degree of reliance on the market, availability of resources, and geographical location, such as rural or urban areas.

Based on the [6], Indonesia is positioned at the 63rd spot among 113 nations in the 2022 edition of the Global Food Security Index (GFSI). It is ranked 10th out of 23 countries in the Asia-Pacific area. The Affordability pillar demonstrates the highest performance, with a score of 81.4, while the Sustainability and Adaptation pillar exhibits the worst performance, scoring 46.3. Indonesia effectively ensures that food is cheap for consumers by implementing robust food safety net initiatives. Nevertheless, there are fundamental deficiencies in the nation's capacity to establish a progressive and food-secure atmosphere. More precisely, it necessitates prioritizing the cultivation of effective research for agricultural advancement and strengthening political dedication to adequately anticipate and adapt to the anticipated hazards linked to climate change [6]. One of the government programs implemented to realize food sovereignty and independence is the publication of the Food Security and Vulnerability Atlas (FSVA) of Indonesia. FSVA Indonesia, which was prepared and published by the Food Security Council, Ministry of Agriculture, and the World Food Program in 2015, grouped food security status into 6 priority categories. Where priority 1 areas are included in areas with high

food insecurity status, and priority 6 are areas with high food security status [7]. The indicators used in the 2018 Food Security and Vulnerability Atlas (FSVA) in Indonesia are divided into two groups of indicators based on data availability and the capacity of these indicators to reflect the core elements of the three pillars of food and nutrition security. The first group of indicators is called vulnerability to chronic food and nutritional insecurity, while the second group of indicators is called transient food insecurity. In the 2018 Food Security and Vulnerability Atlas (FSVA) of Indonesia, it is known that 83% of districts/cities in Indonesia are food secure areas, namely areas that are in priorities 4, 5 and 6.

Based on the recommendations of the Xth National Food and Nutrition Widyakarya in 2012, it was stipulated by Minister of Health Number 75 of 2013 that there was an increase in the average Energy Adequacy Rate (AKE) for the Indonesian population to 2,150 kcal/cap/day, this was due to changes in the structure of the Indonesian population towards older people, causing the average calorie needs of the population to also increase [8]. Based on analysis of AKE data from SUSENAS in 2020, the Aceh Province AKE was 2,091 kcal/cap/day, this figure is almost close to the ideal average AKE, but if we look at the AKE at our rural and urban levels, the AKE value for rural areas reached 2,124 kcal/cap /day higher than urban areas of 2,023 kcal/cap/day. Likewise, the average protein adequacy has increased to 57 grams/cap/day (ideal AKP). Until the end of 2020, the provincial AKP was 61 gran/cap/day. This shows that the current level of consumption of our population is already high. Aceh Province's PPH score for food consumption in 2020 was 73.78; This is an increase from 2019 of 2.28. This achievement is still not satisfactory considering that the target to be achieved in 2020 is still far away at 77.60. However, apart from that, the province's PPH score is greatly influenced by the gap in consumption patterns between urban residents and rural residents. For data from rural areas, the PHH score is still very low, namely 71.12, but urban areas have met the provincial target, namely 79.10. This shows the need for greater intervention and our joint focus, both provincial and regional, for rural areas, especially areas that fall into the Food Vulnerable category, need to be immediately eradicated. As a comparison of Regency/City PPH achievements, Simeulu Regency has the lowest PPH score, namely 57.22, followed by North Aceh, Southwest Aceh, Pidie, and Bireun. This requires strong efforts from the district government to massively increase coordination between stakeholder agencies to increase the PPH score. For the districts/cities of Bener

Meriah, Central Aceh, Langsa, Gayo Lues, and Sabang, the PPH score is above 80 [9].

Food security is a universally important aspect of households [10]. The idea of food security has been widely utilized at the household level to assess wellbeing, and efforts have been made to effectively include this concept into the design, implementation, and evaluation of programs, projects, and policies. Households experiencing moderate food insecurity exhibit decreased food quantities, regularly skip meals, and consume repetitive diets [11]. Households that experience a complete lack of food throughout the day and have people who frequently go without food while sleeping are categorized as extremely food insecure. Attaining food security necessitates the regular availability of sufficient food, adequate financial means or other resources to acquire or trade for food, proper preparation and storage of food, possession of sound knowledge in nutrition and childcare that is put into practice, and access to satisfactory health and sanitation services [12].

Food security is a multifaceted phenomenon. The difficulty in creating standardized metrics and models is due to the intricate nature of the food security concept, which encompasses several dimensions and their interrelationships with diverse social, biological, nutritional, and economic elements. Consequently, it is improbable that any one measure would accurately encompass all dimensions and elements [13]. Food security encompasses several aspects and may be assessed using different methodologies [14]. The stability of the food system is crucial for ensuring food security, as it directly impacts the many aspects of food security. Therefore, sustainability is an essential element that has to be prioritized in order to achieve food security [15]. Acquiring food security at both individual and family levels poses several problems. Most food security studies typically employ two frequently used approaches for measuring food security [16]. One method involves calculating the total output and purchases made by a family during a specific period of time. Additionally, it requires estimating the increase or decrease in the amount of food stored by the household during that period. It is assumed that any food that has entered the household and subsequently departed has been consumed. Another approach involves doing a twenty-four-hour recall of food intake by each participant in the household and examining the calorie content of each indicated food item. The ongoing discussion on food security measurement, which was sparked by the 2002 International Scientific Symposium organized by FAO, has revealed the need for comprehensive measures that encompass the

dimensions of availability, access, utilization, and stability as defined by (World Food Summit, 1996) has not yet been adequately fulfilled. Several recent articles have summarized the continuing discussion by reviewing indicators [17] & [18]. To date, a few studies [19], [20], [21], and [22], studies have been carried out to examine several aspects of rural food security in Indonesia. Food security in Indonesia is determined by three primary components as described by the World Health Organization (WHO): food access, food use, and food availability. Developing a suitable metric for food security outcomes is advantageous for several reasons: to identify individuals who lack access to sufficient food, analyze the specific nature of their insecurity (such as whether it is temporary or long-term), track changes in their situation, and evaluate the effectiveness of interventions [23]. This study aims to ascertain the extent to which market accessibility, in conjunction with other socio-economic factors, contributes to the improvement of household food security in rural regions of eastern Langsa City, Aceh, and to measure food security indicators in those areas.

## II. MATERIALS AND METHODS

### A. Literature Review

Food security refers to the condition wherein each person consistently and unimpededly has the ability to obtain a sufficient quantity of nourishing and secure food that satisfies their dietary needs and personal food inclinations. Such access empowers individuals to maintain a physically active and health-conscious way of life. The concept, which was broadly acknowledged and agreed with at the World Food Summit in 1996, points to the four key dimensions of food security: food availability, food access, food utilization, and food stability. This concept emphasizes the individual's capacity to get and have access to food, as well as the quality of the food and personal preferences related to culture. The statement emphasizes that food security is a complex concept that has to be evaluated using several indicators that together encompass the different aspects of food security. A distinct hierarchy is apparent among these aspects; availability is a prerequisite for food security but does not guarantee access, whereas food access is also a prerequisite but does not assure optimal use of food [24]. Meanwhile, the notion of stability encompasses the first two characteristics and might pertain to the fluctuation and uncertainty in both the availability and access. As acknowledged by the global community of experts [25] and [26], none of the indicators can comprehensively encompass all four elements of food security. Hence, it is necessary to employ a blend of measurements and indicators to accurately depict the intricate nature of food insecurity in every specific situation. Quantifying the intricacy of

food security is a component of a more extensive discussion. In order for household food security metrics to be effectively implemented through community-based networks, they must possess the qualities of being user-friendly, cost-effective, easily assessable, and accurately representative of the real conditions at both the household and community levels [27]. An optimal assessment of food security entails a technique that encompasses all the characteristics outlined in the concept of food security [28]. Various research employed diverse methodologies to assess food security. [29] examined the variables that influence food security within households in Nigeria. The logistic regression analysis revealed a positive association between the number of dependent family members and the likelihood of experiencing household food insecurity over time. A higher reliance ratio leads to a greater load on working individuals to cover the expenses of basic household nourishment. Consequently, this results in a higher level of food insecurity. [30] the concept of home food security may be understood by examining three distinct dimensions: historical food availability, present food reserves, and projected future food supply that is sufficient to fulfill the dietary requirements of all household members. [31] the model was developed using the classification and regression tree (CART) approach to analyze the idea of resilience in relation to food insecurity. The data used for this analysis was obtained from the 11th Palestinian Public Perception Survey. [32] addressed the problem with a two-phase approach. Firstly, the food security status was determined using the calorie intake methodology. Secondly, the logistic regression approach was employed to evaluate the socio-economic determinants influencing food security. [33] analyzed food security trends at both the national level and household level, along with the factors that influence household food security. [34] investigates the diverse effects of gendered family leadership and control over resources on food security in rural Tanzania.

After conducting a thorough examination of the literature and engaging in talks with culinary specialists and academia, a total of 15 factors were found. The following variables are provided: The variables of interest include the age and educational level of the family head, the size of the household, the number of earning members, the monthly income, the monthly food costs, the distance to the nearest road and market, the transportation cost, the potential loss of work, health expenses, food prices, debt, crop diseases, and the availability of irrigation water.

### B. *Methodology*

For this study, we exclusively conducted interviews with male individuals who are the heads of their households. The participants were informed about the study's aims, purpose, and potential outcomes. They were also guaranteed that their information would solely be utilized for educational reasons. Prior to commencing a formal interview, the respondent's affirmation or willingness was obtained. At this stage, a number of respondents opted out of participating in the survey and were substituted with other respondents in order to maintain the desired sample size. This study employed a two-stage methodology to examine the data collected from a food security survey conducted among 300 families in East Langsa. Explanatory Factor Analysis (EFA) was used first to classify the components into sub-factors. A total of 15 significant variables were discovered. The specialists with food security experience carefully identified suitable parameters. The indications are seen in Table 1. In the second phase, a set of 15 variables were utilized to develop a questionnaire aimed at assessing the level of food security in households residing in East Langsa. Exploratory factor analysis (EFA) was employed to identify the underlying variables from the various aspects related to household food security. This analysis was conducted using data collected from 300 respondents. The investigation utilized scores obtained from 15 home food security indicators to perform group categorization. This study employed principal component analysis to extract factors using SPSS 20.

**Table 1**. Indicators of Food Security Variables

| No. | Indicator |
|---|---|
| 1 | Age of household head |
| 2 | Education of household head |
| 3 | Household size |
| 4 | Earning members |
| 5 | Monthly income |
| 6 | Monthly food expenses |
| 7 | Distance to road |
| 8 | Distance to market |
| 9 | Transportation cost |
| 10 | Employment loss |
| 11 | Health expenses |
| 12 | Food prices |
| 13 | Debt |
| 14 | Crop diseases |
| 15 | Irrigation water |

The acquired data is analyzed using a quantitative technique to identify the variables. The EFA approach, specifically factor analysis, was selected to decrease the number of variables represented by the component items of the questionnaire. The PCA methodology was employed to create the factors. As stated by reference [35], Principal Component Analysis (PCA) is the most straightforward method for extracting components. This approach constructs a linear combination of observable indicators.

## III.    RESULTS AND DISCUSSIONS

A total of 15 variables have been discovered based on a comprehensive review of literature and expert opinion. Subsequently, a survey is conducted in order to gather data. A sample size of 300 is obtained through surveys. Data set 300 is suitable for doing the analysis. The reliability of a questionnaire is assessed by measuring the internal consistency of variables using Cronbach's Alpha. The Cronbach's Alpha value is 0.807, which is considered good since it exceeds the threshold of 0.7. Table 2 displays the dependability data, namely the Cronbach's alpha value.

**Table 2.** Cronbach's alpha

**Case processing summary**

|  |  | N | % |
|---|---|---|---|
| Case | Valid | 300 | 100.0 |
|  | Excluded | 0.00 | 0.00 |
|  | Total | 300 | 100.0 |

| Cronbach's alpha | Cronbach's alpha | Cronbach's alpha based on Standardized items | N of items |
|---|---|---|---|
|  | 0.807 | 0.808 | 15 |

The Kaiser-Meyer-Olkin (KMO) and Bartlett's test is conducted, and the outcome of the test is presented in Table 3. Table 3 shows that the KMO value is 0.836, and the significance value is 0.000. Hence, the data are suitable for doing factor analysis.

**Tabel 3.** KMO and Bartlett's Test

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy |  | 0.836 |
|---|---|---|
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1014.114 |
|  | df | 104 |
|  | Sig. | .000 |

Table 4 displays the communalities results. Table 4 shows that the majority of the variables have communalities greater than 0.5. The variables $X_6$ and $X_{10}$ have values of 0.486 and 0.438, respectively.

Based on the communalities finding, a total of 15 variables or items were selected. Four components are identified with eigenvalues larger than one, explaining a total variance of 54.705%. This result is considered satisfactory and is presented in Table 5. Four factors were identified, each consisting of three observed variables. These factors exhibited high loadings, above 0.30. Principal component analysis is employed to decrease the original abundance of variables to a more limited quantity of comprehensible elements.

**Tabel 4.** Communalities

| Variabel | Initial | Extraction |
|---|---|---|
| $X_1$ | 1.000 | 0.674 |
| $X_2$ | 1.000 | 0.563 |
| $X_3$ | 1.000 | 0.585 |
| $X_4$ | 1.000 | 0.552 |
| $X_5$ | 1.000 | 0.547 |
| $X_6$ | *1.000* | *0.486* |
| $X_7$ | 1.000 | 0.507 |
| $X_8$ | 1.000 | 0.511 |
| $X_9$ | 1.000 | 0.586 |
| $X_{10}$ | *1.000* | *0.438* |
| $X_{11}$ | 1.000 | 0.527 |
| $X_{12}$ | 1.000 | 0.576 |
| $X_{13}$ | 1.000 | 0.606 |
| $X_{14}$ | 1.000 | 0.520 |
| $X_{15}$ | 1.000 | 0.526 |

**Table 5**. Number of Factors Formed

| Component | Initial Eigenvalues | | |
|---|---|---|---|
|  | Total | % of Variance | Cumulative % |
| 1 | 4.243 | 28.283 | 28.283 |
| 2 | 1.791 | 11.943 | 40.227 |
| 3 | 1.17 | 7.8 | 48.026 |
| 4 | 1.002 | 6.678 | 54.705 |
| 5 | 0.933 | 6.22 | 60.925 |
| 6 | 0.823 | 5.485 | 66.41 |
| 7 | 0.723 | 4.822 | 71.231 |
| 8 | 0.683 | 4.553 | 75.785 |
| 9 | 0.647 | 4.314 | 80.098 |
| 10 | 0.584 | 3.893 | 83.991 |
| 11 | 0.55 | 3.666 | 87.657 |
| 12 | 0.517 | 3.444 | 91.102 |
| 13 | 0.503 | 3.356 | 94.457 |
| 14 | 0.437 | 2.914 | 97.371 |
| 15 | 0.394 | 2.629 | 100 |

Table 5 shows that the number of factors formed is four factors, namely the first factor has an eigenvalues number of *4.243*, the second factor is *1.791*, the third factor is *1.17*, and the fourth factor is *1.002*, but for the fifth factor the eigenvalues number is

already $< 1$, namely 0.933, so the factor analysis process stops at the fourth factor only. The total percentage variance of the five factors is *28.283% + 11.943% + 7.8% + 6.678% = 54.705%*. This means that *54.705%* of all existing variables can be explained by the four factors formed. In this study, factor analysis with the PCA extraction obtained four factors that affect the household food security in East Langsa. These factors have a total of fifteen variables. The four factors in the PCA extraction method are each given a name according to the grouping of results on factor rotation.

Four components have been taken from extract initial factors as shown in Table 6:

**Tabel 6.** Components of Extract Initial

|   | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 0.206 | 0.586 | 0.326 | 0.427 |
| 2 | 0.493 | 0.495 | 0.225 | 0.158 |
| 3 | 0.597 | 0.381 | 0.067 | -0.283 |
| 4 | 0.626 | 0.129 | -0.315 | -0.212 |
| 5 | 0.663 | 0.241 | 0.095 | -0.199 |
| 6 | 0.554 | 0.238 | 0.211 | 0.28 |
| 7 | 0.627 | 0.013 | -0.337 | 0.019 |
| 8 | 0.392 | 0.22 | -0.554 | -0.042 |
| 9 | 0.342 | 0.004 | 0.381 | -0.569 |
| 10 | 0.454 | 0.111 | -0.386 | 0.268 |
| 11 | 0.641 | -0.205 | 0.168 | -0.214 |
| 12 | 0.591 | -0.439 | -0.164 | 0.087 |
| 13 | 0.592 - | -0.461 | 0.137 | 0.154 |
| 14 | 0.479 | -0.494 | 0.174 | 0.127 |
| 15 | 0.504 | -0.418 | 0.193 | 0.246 |

The rotation of the component matrix with the Varimax-Kaiser normalization is shown in Table 7.

**Table 7.** Rotated component matrix

|   | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | -0.104 | -0.027 | 0.813 | -0.046 |
| 2 | 0.03 | 0.197 | 0.68 | 0.249 |
| 3 | 0.012 | 0.362 | 0.35 | 0.575 |
| 4 | 0.149 | 0.631 | 0.075 | 0.356 |
| 5 | 0.182 | 0.346 | 0.341 | 0.527 |
| 6 | 0.284 | 0.185 | 0.594 | 0.134 |
| 7 | 0.296 | 0.622 | 0.111 | 0.145 |
| 8 | -0.057 | 0.711 | 0.032 | 0.042 |
| 9 | 0.116 | -0.108 | -0.003 | 0.749 |
| 10 | 0.184 | 0.583 | 0.217 | -0.135 |
| 11 | 0.502 | 0.179 | 0.068 | 0.488 |
| 12 | 0.656 | 0.366 | -0.086 | 0.069 |
| 13 | 0.757 | 0.119 | 0.062 | 0.12 |
| 14 | 0.714 | 0.019 | 0.001 | 0.1 |
| 15 | 0.712 | 0.033 | 0.128 | 0.034 |

Ultimately, four components were extracted following the rotation of the component matrix using Varimax with Kaiser Normalization, with no alterations occurring.

The EFA results led to the classification of the variables into four appropriately designated dimensions. Table 8 displays the dimensions and their related variables. The investigation unveiled the subsequent dimensions. The factors included in this analysis are: 1) the household debt, 2) distance to the market, 3) age of the household head, and 4) transportation costs.

**Table 8.** The Dimensions and The Corresponding Variables

| No. | Dimension | Variable |
|---|---|---|
| A | The household debt | $X_{11}$ (health expenses)<br>$X_{12}$ (food prices)<br>$X_{13}$ (household debt)<br>$X_{14}$ (crop diseases)<br>$X_{15}$ (irrigation water) |
| B | Distance to the market | $X_4$ (earning members)<br>$X_7$ (distance to road)<br>$X_8$ (distance to market)<br>$X_{10}$ (employment loss) |
| C | Age of the household head | $X_1$ (age of household head)<br>$X_2$ (education of household head)<br>$X_6$ (monthly food expenses) |
| D | Transportation cost | $X_3$ (household size)<br>$X_5$ (monthly income)<br>$X_9$ (transportation cost) |

According to the outcomes of the varimax rotation, it is evident that all variables are grouped into four categories. Each of the four components is assigned a distinct name based on the categorization of variables within that factor. Nevertheless, it is important to acknowledge that the process of defining factors lacks

scientific rigor and relies on the subjective judgment of the analyst [36].

a. Factor 1 consists of 5 elements: $X_{11}$ (health expenses), $X_{12}$ (food prices), $X_{13}$ (household debt), $X_{14}$ (crop diseases), and $X_{15}$ (irrigation water). Factor 1 can be named "household debt". This is in line with the research, namely [37], a study indicated that household debt can substantially decrease the proportion of income spent on food. The household debt factors has a variance of *28.283%*. This means that *28.283%* of the household food security in East Langsa is affected by the household debt.

b. Factor 2 consists of 5 elements: $X_4$ (earning members), $X_7$ (distance to road), $X_8$ (distance to market), and $X_{10}$ (employment loss). Factor 2 can be named "distance to market". This is in line with the research, namely [38], which stated that households located closer to market centers spend more on total household consumption expenditure, consume more diverse diets, and are less food insecure than households located farther away from markets. The distance to market factors has a variance of *11.943%*. This means that *11.943%* of the household food security in East Langsa is affected by the distance to market.

c. Factor 3 consists of 3 elements: $X_1$ (age of household head), $X_2$ (education of household head), and $X_6$ (monthly food expenses). Factor 3 can be named "age of household head". The age of household head factors has a variance of *7.8%*. This means that *7.8%* of the household food security in East Langsa is determined affected by age of household head. This factor can be said to be a relatively small determinant of household food security because based on findings in research, namely [39], which stated that age of household head has no significant effect on household food security, and [40], which stated that age of household head is negatively related to food security.

d. Factor 4: $X_3$ (household size), $X_5$ (monthly income), and $X_9$ (transportation cost). Factor 4 can be named "transportation cost". This is in line with the research, namely [41], which stated that transportation difficulties exacerbate food acquisition problems. The transportation cost factors has a variance of *6.678%*. This means that *6.678%* of the household food security in East Langsa is affected by transportation cost.

## IV. CONCLUSIONS

Food security refers to the availability and accessibility of food that is nutritionally adequate and culturally acceptable to every individual in a home, obtained through socially acceptable means, in order to maintain a healthy life. The research findings indicate that many factors have an impact on the household food security in East Langsa, Aceh. The determinants include the household debt, distance to the market, age of the household head, and transportation costs. These factors were derived from preliminary experiments using the factor analysis technique. We established constructs by drawing upon pertinent literature. The objective of seeking home food security is to develop a model that may serve as a government guideline for preventing food insecurity. Not only in terms of societies, but also in other facets of the village as a whole. The findings of the study utilizing the EFA also indicate that there exist additional significant elements that contribute to family food security, but were not included in this particular research. Future EFA research should adhere to established criteria by explicitly documenting the extraction and rotation techniques employed, as well as the methods employed to retain factors. Additionally, it is advisable to employ various approaches, such as extraction, rotation, and factor retention. It is highly advisable to provide comprehensive information on all the decisions taken throughout the implementation of an Exploratory Factor Analysis (EFA). It is crucial for researchers to have a clear understanding of how to correctly utilize PCA and common factor analysis. Additionally, they should be aware of the possible adverse outcomes that might arise from using PCA with varimax rotation in an inappropriate study setting.

## VI. REFERENCES

[1] G. Datt, K. R. Simler, S. Mukherjee and G. Dava, "AgEcon Search," 2000. [Online]. Available: https://ageconsearch.umn.edu/record/16427/.

[2] H. H. Jensen, "Food insecurity and the food stamp program," American Journal of Agricultural Economics, vol. 84, no. 5, pp. 1215-1228, 2002.

[3] I. Musindar and M. Arhim, "Ketahanan pangan rumah tangga pembuat tortila di kota Palopo," Perbal: Jurnal Pertanian Berkelanjutan, vol. 6, no. 2, pp. 43-53, 2018.

[4] D. A. Mekonnen and N. Gerber, "Aspirations and food security in rural Ethiopia," Food Security, vol. 9, no. 2, pp. 371-385, 2017.

[5] E. Rahmawati, "Aspek Distribusi pada Ketahanan

Pangan Masyarakat di Kabupaten Tapin," AGRIDES: Jurnal Agribisnis Perdesaan, vol. 2, no. 3, p. 9252, 2012.

[6] D. D. Rohrbach and J. Alumira, "Drought, rural household decision making and technological change in southern Zimbabwe," dalam International Center for Research in Agroforestry, Nairobi, Kenya, 2002.

[7] "Global Food Security Index 2022".

[8] "Badan Ketahanan Pangan," 2018. [Online]. Available: https://badanpangan.go.id/.

[9] "Dinas Pangan Aceh," 2021. [Online]. Available: https://dinaspangan.acehprov.go.id/berita/kategori/berita/kondisi-ketahanan-pangan-aceh.

[10] J. L. Leroy, M. Ruel, E. A. Frongillo, J. Harris and T. J. Ballard, "Measuring the food access dimension of food security: a critical review and mapping of indicators," Food and nutrition bulletin, vol. 36, no. 2, pp. 167-195, 2015.

[11] A. Saint Ville, J. Y. T. Po, A. Sen, A. Bui and H. Melgar-Quiñonez, "Food security and the Food Insecurity Experience Scale (FIES): ensuring progress by 2030," Food Security, vol. 11, pp. 483-491, 2019.

[12] FAO, IFAD, UNICEF, WFP dan WHO, "The State of Food Security and Nutrition in the World (SOFI)," 2021. [Online]. Available: https://policycommons.net/artifacts/1850109/the-state-of-food-security-and-nutrition-in-the-world-2021/2596732/.

[13] E. A. Frongillo Jr, "Validation of measures of food insecurity and hunger," The Journal of nutrition, vol. 129, no. 2, pp. 506S-509S, 1999.

[14] S. A. Anderson, "Core indicators of nutritional state for difficult-to-sample populations," The Journal of nutrition, vol. 120, pp. 1555-1598, 1990.

[15] S. L. Hendriks, "The food security continuum: a novel tool for understanding food insecurity as a range of experiences. In Food security and child malnutrition," Apple Academic Press, pp. 27-48, 2016.

[16] F. Shiferaw, R. L. Kilmer and C. Gladwin, "Determinants of food security in Southern Ethiopia," American Agricultural Economic Association, Montreal, 2003.

[17] J. Coates, "Build it back better: Deconstructing food security for improved measurement and action," Global Food Security, vol. 2, no. 3, pp. 188-194, 2013.

[18] A. D. Jones, F. M. Ngure, G. Pelto and S. L. Young, "What are we assessing when we measure food security? A compendium and review of current metrics," Advances in nutrition, vol. 4, no. 5, pp. 481-505, 2013.

[19] S. Widyandini, "Pemodelan Ketahanan Pangan Provinsi di Indonesia Berdasarkan Konsumsi Energi Menggunakan Metode Probit Data Panel," Institut Teknologi Sepuluh Nopember, Surabaya, 2016.

[20] D. L. Permatasari and V. Ratnasari, "Pemodelan ketahanan pangan di Indonesia dengan pendekatan regresi probit ordinal," Jurnal Sains dan Seni ITS, vol. 5, no. 2, 2016.

[21] F. Masitoh and V. Ratnasari, "Pemodelan status ketahanan pangan di Provinsi Jawa Timur dengan pendekatan metode regresi probit biner," Jurnal Sains dan Seni ITS, vol. 5, no. 2, 2016.

[22] V. F. Rochmah and V. Ratnasari, "Pemodelan Ketahanan Pangan di Jawa Timur Menggunakan Metode Geographically Weighted Ordinal Logistic Regression (GWOLR)," Jurnal Sains dan Seni ITS, vol. 8, no. 2, pp. D397-D404, 2020.

[23] J. Hoddinott and Y. Yohannes, "Dietary diversity as a food security indicator," International Food Policy Research Institute (IFPRI), 2002.

[24] C. B. Barrett, "Measuring food insecurity," Science, vol. 327, no. 5967, pp. 825-828, 2010.

[25] K. Hussein, "Food Security: Rights, Livelihoods and the world food summit–five years later," Social Policy & Administration, vol. 36, no. 6, pp. 626-647, 2002.

[26] J. Hoddinott, Choosing outcome indicators of household food security, vol. 7, Washington, DC: International Food Policy Research Institute, 1999.

[27] H. Melgar-Quinonez and M. Hackett, "Measuring household food security: the global experience," Revista de Nutrição, vol. 21, pp. 27s-37s, 2008.

[28] D. Magaña-Lemus and J. Lara-Álvarez, Food security measurement: An empirical approach. In Food Security in an Uncertain World, vol. 15, Emerald Group Publishing Limited, 2015, pp. 49-62.

[29] P. S. Amaza, J. C. Umeh, J. Helsen and A. O. Adejobi, "Determinants and measurements of food insecurity in Nigeria: some empirical policy guide," dalam International Association of Agricultural Economists (IAAE), Queensland, Australia, 2006.

[30] J. Gittelsohn, S. Mookherji and G. Pelto, "Operationalizing household food security in rural Nepal," Food and Nutrition Bulletin, vol. 19, no. 3, pp. 210-222, 1998.

[31] L. Alinovi, E. Mane and D. Romano, "Measuring household resilience to food insecurity: application to Palestinian households," Agricultural survey methods, pp. 341-368, 2010.

[32] M. K. Bashir, M. K. Naeem and S. A. K. Niazi, "Rural and peri-urban food security: a case of district Faisalabad of Pakistan," World Applied Sciences Journal, vol. 9, no. 4, pp. 403-411, 2010.

[33] M. K. Bashir, S. Schilizzi and R. Pandit, "The Determinants of Rural Household Food Security in the Punjab, Pakistan: An Econometric Analysis," 2012.

[34] R. Mason, P. Ndlovu, J. R. Parkins and M. K. Luckert, "Determinants of food security in Tanzania: gendered dimensions of household headship and control of resources," Agriculture and human values, vol. 32, pp. 539-549, 2015.

[35] R. A. Johnson and D. W. Wichern, 2007. [Online]. Available: https://www.webpages.uidaho.edu/.

[36] J. F. Hair, W. C. Black, B. J. Babin and R. E. Anderson, Multivariate Data Analysis, New York: Pearson, 2010.

[37] Y. Huang and F. Chen, "The impact of household debt on food expenditure and its mechanism in urban China," Journal of Family and Economic Issues, vol. 43, no. 3, pp. 466-475, 2022.

[38] M. A. Usman and M. G. Haile, "Market access, household dietary diversity and food security: Evidence from Eastern Africa," Food Policy, vol. 113, p. 102374, 2022.

[39] S. A. Mutiah and I. Istiqomah, "Determinants of household food security in urban areas," Jejak, vol. 10, no. 1, pp. 103-120, 2017.

[40] D. D. Mengistu, D. T. Degaga and A. S. Tsehay, "Analyzing the contribution of crop diversification in

improving household food security among wheat dominated rural households in Sinana District, Bale Zone, Ethiopia," Agriculture & Food Security, vol. 10, pp. 1-15, 2021.

[41] S. Garasky, L. W. Morton and K. A. Greder, "The effects of the local food environment and social support on rural food insecurity," Journal of Hunger & Environmental Nutrition, vol. 1, no. 1, pp. 83-103, 2006.