Regional Overview of Food Security from Two Dimensions: Availability and Access to Food, East Java Province

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Abstract. Food security has always been a topic of keen interest to policy-makers, practitioners, and academics worldwide. In the operational sense, food security concerns the availability, accessibility, and stability of its procurement. The leading indicators of food security at the household level access (physical and economic) to food, food availability and risks associated with food access and availability. A study was conducted by utilizing data from several government institutions to examine the level of regional and household food security of East Java Province. The result showed that the food security level of East Java Province has increased between 2010 and 2017, mainly because of improvements in several indicators of food security and nutrition. However, two main challenges require serious attention, namely: a) increasing economic access to food, mainly through increased investment and infrastructure and b) addressing increased vulnerability to the risk of climate change. In conclusion, this paper discusses information and suggestions to improve the food security level in the province, including approaching programs and policies related to the issues.

Keywords. Accessibility, Availability, Food Security, Policy.

1. Introduction

The Central Statistics Agency (known as BPS) stated that East Java Province was the second largest population in Indonesia. East Java was also the province with the second largest regional Gross Domestic Product (GDP), with 14.61 percent for national GDP[1]. However, the population living below the poverty line in this province was the largest in Indonesia. The province’s poverty rate of 10.37 percent was also above the national poverty rate[2]. In September 2017, the level of inequality in the expenditure measured by the Gini ratio was recorded at 0.415. This figure increased by 0.019 points compared to the March 2017 Gini ratio of 0.396[3]. During 2018, East Java Province ranked second as the most disaster-prone region in Indonesia. The National Disaster Management Agency (known as BNPB) noted 422 disasters occurred during that period. The increased intensity and frequency of storms, drought and flooding, altered hydrological cycles, and precipitation variance have implications for future food availability[4]. While overall food production may not be threatened, those least able to cope will likely bear additional adverse impacts. Besides, East Java also faces the effects of climate change, which risks increasing vulnerability to transient and chronic food insecurity. Research stated the impact of climate change on Java are cumulative; during strong El Niño years, production shortfalls in the wet season are not made up later in the crop year[5]. Moreover, Pratama and Siddique[6] argued that environmental degradation is one of the major factors which affects food security.
With these conditions, coupled with increasing population and slow-moving economic growth, food security in East Java Province must continue to be a significant concern. Previous studies that specifically addressed food security in the province of East Java were carried out over long periods[7],[8]. Other current studies emphasized the potential and prospects of certain activities or things to support regional food security[9] [10][11] and mapping or spatial analysis of local food security[12],[13]. Therefore, this study was conducted to analyze the condition of food security in East Java Province. The research focuses on two indicators of food security, where food security is achieved when (1) food is available in the community. Any place, and (2) every household can access it. The two meanings are interrelated because even though food supplies in the community are sufficiently available, there is no value of "food secure" if the household cannot access them.

2. Research Method
This research employed a descriptive research method with a quantitative approach. According to Yusuf[14], this method is aimed to describe and explain an event that has occurred in the past or has been occurring in the present in the form of meaningful figures. Bungin[15] stated that the descriptive method is applied by taking the steps of collecting, classifying, and analyzing or processing data, and making conclusions and reports. The quantitative approach in this study is by measuring the indicators of the research variables so that an overview is obtained between the variables[14]. The data for the analysis of regional and household food security of East Java Province was obtained from several institutions based on secondary data (time series from 2009 to 2019). The institutions included Central State Agency (BPS), Ministry of Agriculture, Office of Food Crops and Horticulture, Plantation and Forest Office, Trade Office, Food Security Agency, National Development Planning Agency, and Regional Development Planning Agency, Ministry of Health, and so on. The data consisted of the performance of the production of food commodities, supply (stock), food trade (import and export), household income and expenditure, energy and protein consumption, demographic characteristics, and other related data. Data analysis were manually organized and processed by applying a computer program, Microsoft Office Excel 2016.

3. Results and Discussion
Sufficient national food supply does not guarantee regional or household food security[16]. Sawit and Ariani[17] suggested that the determinants of food security at the national, regional, and local levels can be seen from production, demand, supply, and food trade. Other indicators can also be seen from the share of household expenditure[18]. Therefore, in this section, the explanation of food security of East Java Province is divided into two subsections, namely food availability and food accessibility. The third subsection recommends policy implications addressing the challenges in the region.

3.1. Food Availability
Table 1 presents the average production and trends (growth rates) of 33 food commodities in East Java Province categorized based on their nutrient sources (carbohydrates, vegetable and animal protein, vitamins, and minerals) during the period 2009 to 2017. In general, food production in Java Province East has continued to increase over the past decade.

| Food Commodity          | Production (tons) | Trends (%) |
|-------------------------|------------------|------------|
| Carbohydrate Sources    | 5,465,098.39     | 2.25       |
| Vegetable Protein Sources | 196,341.52      | -5.67      |
| Animal Food Sources a   | 70,239,414.63    | 3.88       |
| Vitamin and Mineral Sources a,b | 421,144.55 | 6.10       |

Source: BPS of East Java Province[19] (various years, data processed)

aData from the year 2010 – 2017; bData from the year 2013 – 2017
The trend in the production of carbohydrate sources of food commodities, which were cereals (rice, corn, cassava, and sweet potatoes), had increased by 2.25 percent per year. The increasing trends in production were the results of increased harvest area and productivity. Production of legume commodities, which were a source of vegetable protein, tended to decrease with -5.67 percent per year. The decrease in production was mainly due to the reduced planting area of the commodity because commodities that were seen as more profitable displaced it. Vegetable foods were a common source of vitamins and minerals derived from fruits and vegetables. The dominant fruit commodities produced were bananas, mango, oranges, and papaya. Judging from the trends, these fruits’ production tended to increase. Conversely, the production of melons and watermelons had decreased. Production of tomato and chili, as the dominant vegetables from 2013 to 2017, tended to increase. The show of animal protein sources consisted of sixteen types of animal food sources. The production of purebred chicken and sea fish experienced a significant increase in large quantities, while beef or buffalo, eggs, and milk decreased.

Furthermore, Table 2 presents the trends of trade in dominant food commodities (exports and imports) in East Java Province during the period 2015 to 2017. From the commodity trade to outside the region (exports), it appears that staple food production, rice, experienced a surplus so that it could be sold to other areas. Likewise, the trading of sugar cane, fruit, and vegetables also increased significantly during this period. On the contrary, the trade of corn and wheat food commodities tended to decrease. From the commodity trade into the region (imports), food commodities such as fat and oil, fish and shrimp, processed meat and fish products, and flour experienced downward trends. Only the trade of fruit commodities experienced an increase during the period of 2015 to 2017.

### Table 2. The average production and trends of food commodities in East Java Province, the year 2009 – 2017.

| Exported Food Commodity | Trends (%) | Imported Food Commodity | Trends (%) |
|-------------------------|------------|-------------------------|------------|
| Rice                    | 670.02     | Animal/Vegetable Fat and Oil | -3.03      |
| Corn                    | -57.10     | Fish and Shrimp          | -2.81      |
| Wheat                   | -20.62     | Processed Meat and Fish  | -3.43      |
| Soy                     | 1.68       | Fruits                   | 42.29      |
| Sugar Cane              | 47.01      |                         |            |
| Onions                  | 20.76      |                         |            |
| Grape and Apple         | 73.24      |                         |            |

Source: BPS of East Java Province[19], [20] (various years, data processed)

In the description of food availability, it is further limited to the availability of food per capita, which any types of food available for consumption by households, retailers, ready-made food companies/industries, restaurants, and others in specific periods. These data on food availability can provide an overview of the volume of availability for individuals. The availability of the essential food commodities in East Java Province during the year 2015 to 2019 are presented in Table 3 below. The Desirable Dietary Pattern (DDP) score is one indicator of the success of development in food security. In 2019, the Food Security Agency determined the score by 92.5 out of 100 (ideal score). This approach reflected the quality of population food consumption. The higher the score, the more diverse and nutritionally balanced the consumption of food is. From Table 3, it can be seen that the DDP score of East Java Province in 2019 was above the national score. This indicated the regional condition of East Java Province was in the level of food security.

Although in terms of food availability, East Java Province was declared food secure, some challenges remained the primary concern. For all regencies in the province, including those that currently have production surplus, climate change, drought, and flood posed a severe threat to the sustainability of current production levels. Food crop production has increased in recent years. Still, the impact of climate change phenomena on agriculture, such as erratic weather patterns, increased crop pests, and
natural disasters, can threaten what has been achieved so far and hamper the progress of food security. Conversion of agricultural land into non-agricultural land also remained a concern of the government.

**Table 3.** The availability of the essential food commodities in East Java Province, the year 2015 – 2018.

| Food Commodity | 2015     | 2016     | 2017     | 2018     | 2019     |
|----------------|----------|----------|----------|----------|----------|
| Rice           | 7,741,873| 7,780,579| 7,819,486| 7,858,584| 7,897,877|
| Corn           | 6,378,543| 6,474,225| 6,571,336| 6,669,907| 6,769,955|
| Soy            | 454,307  | 480,800  | 490,417  | 500,225  | 510,229  |
| Meat           | 349,945  | 358,693  | 367,660  | 376,852  | 386,274  |
| Eggs           | 337,599  | 345,026  | 352,616  | 360,374  | 368,302  |
| Milk           | 406,946  | 414,271  | 421,728  | 429,319  | 437,047  |
| Fish           | 1,478,831| 1,555,907| 1,637,928| 1,725,222| 1,822,162|
| Sugar          | 1,336,770| 1,386,280| 1,435,790| 1,485,300| 1,534,810|
| Score*         | 82.6     | 84.8     | 89.7     | 92.5     | 92.8     |

Source: BPS of East Java Province and Food Security Agency of East Java Province[21], [22] (various years, data processed)

*Score of Desirable Dietary Pattern

Despite the non-significant changes in the amount of non-agricultural land in the last five years, the high needs for residential and other utilizations can reduce the agricultural land area from year to year. Provincial BPS data from 2014 to 2017 shows a decrease of 7,813 hectares or an average of 1,953 hectares per year. Some areas, such as the city of Mojokerto, now only have 630 hectares of agricultural land. Likewise, the city of Malang only has 844 hectares of land, while in the Sidoarjo, new regency areas were recorded by 22,000 hectares in 2017. Moreover, the decline in the amount of agricultural land has resulted in an average share of agricultural land in East Java, only around 0.35 hectares per farmer household[22]. With such a limited area of agricultural land, the productivity per land area remains a significant challenge for the Provincial Government in securing food production. Besides, the high percentage of small farmers (peasants) in East Java risks affecting food security. Nearly 4,008,788 households (78.34 percent) of 5,117,025 agricultural land use households in East Java are smallholders[22].

### 3.2. Food Accessibility

Food access is related to the ability of families to obtain enough food, both from their production, stock, purchases, barter, gifts, loans, and food aid. Food may be physically available in an area, but it cannot be accessed by certain households because of limited: a) physical access: market infrastructure, access to reach markets and market functions; b) economic access: the financial capacity to buy adequate and nutritious food; and c) social access: social capital that can be used to obtain informal support mechanisms such as barter, borrowing or social support programs.

Household access to food is highly correlated with poverty status[23]. In East Java Province, the poverty rate decreased significantly from 14.23 percent in 2011 to 12.34 percent in 2015. Recently, the province still has 4.7 million people living below the poverty line[24]. Nationally, the poverty level of East Java Province ranks 15th out of 34 provinces. Despite the decline in poverty, high economic growth was followed by increasing inequality between the rich and the poor. The Gini coefficient (a measure of income equality) has experienced a significant increase from 0.34 in 2010 to 0.37[24]. This illustrates the increasing gap between the rich and the poor.

There are still 72 sub-districts (12.1 percent), of which more than 20 percent of the population lives below the poverty line. Access to connecting facilities is essential to determine the level of connectivity between villages that determines food accessibility and distribution and food prices. However, there were still 5 sub-districts (0.8 percent) where the villages did not have adequate road access or water transportation or were accessible both by land and water throughout the year. The
three districts with the highest percentage of inadequate access are located in Sumenep and Bondowoso regencies.

3.3. Policy Implication
Two challenges in the household and regional food security of East Java Province open up opportunities for improvement as follows:

Climate Change
Climate change remains a major threat to food security. Strategies for climate adaptation and appropriate water management are essential. Water management in East Java can be strengthened through improving spatial planning and land-use systems, conservation management and important ecosystem areas, rehabilitation of degraded ecosystems, and accelerated development and rehabilitation of infrastructure needed to support agricultural activities (including irrigation, dams, reservoirs) using proven climate technology. Other opportunities are to improve early warning systems for predicted (slow-onset) and sudden-onset disasters and create incentive programs for research and development in increasing crop resilience to climate conditions.

Economy Access to Food
The Provincial Government of East Java has succeeded in reducing poverty in the last decade, but the pace of poverty reduction has slowed in recent years and even slightly increased in March 2015. Therefore, it is necessary to increase budget allocations for social assistance programs and reforms aimed at increasing the sensitivity and effectiveness of nutrition so that the program can have an impact on food access. Improved food distribution systems, especially for people in the islands and remote areas (particularly in Sumenep Regency), where food distribution is an obstacle during certain seasons, through the improvement of key infrastructures, such as roads and transportation facilities, traditional market development, and strengthening market institutions. Stabilization of food supply and prices through setting Government Purchasing Prices to protect rice producers and setting of the Highest Retail Price from protecting consumers from soaring market prices. Agricultural policy studies can help find the right balance between supporting domestic food production and protecting poor consumers' access to food and maintaining the competitiveness of the agricultural sector. Review incentives for food production, including price guarantees, subsidies, and trade, aim to help ensure that the production of highly nutritious food, including soybeans, vegetables, and fruits, is given the same priority as staple food production.

4. Conclusion
This study discovered that food security has increased for most of the people of East Java Province between 2010 and 2017, mainly as a result of improvements in several indicators. These results are encouraging, but progress can be hampered if the main challenges are not handled properly, namely: a) addressing increased vulnerability to climate change; and b) increasing economic access to food. Thus, the study suggests several strategies for climate adaptation, including appropriate water management, improvement of early warning systems for predicted (slow-onset) and sudden-onset disasters, and creating incentive programs for research and development in increasing crop resilience to climate conditions. Meanwhile, the improvement of food distribution systems through increased investment and infrastructure is urgently needed. This, along with appropriate policies on food supplies and prices, help ensure the right balance between supporting domestic food production, protecting poor consumers' access to food, and maintaining the competitiveness of the agricultural sector. Nevertheless, the study has a limitation to be addressed in future research. The study focused only on two dimensions of food security, whereas this subject is multidimensional, and each dimension is closely related to each other. Therefore, further studies on other dimensions of food security: food utility, and safety are also needed to discuss the regional food security in the province thoroughly.

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