Posible Use of Food Security and Vulnerability Atlas (Fsva) to Detect Problem on Poverty and Stunting, The Case of Banten Province

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Abstract. The paper examined whether the Food Security and Vulnerability Atlas (FSVA) could be used to indicate the actual incident happen on poverty and childhood malnutrition in certain areas. It would be useful for the policy maker to target programs consistent with the National SDG target guided by the FSVA. The quantitative analysis was carried out using correlation analysis between 2 predetermined variables, namely: score and the rank of food security of cities/regencies in Banten Province against 5 exante variables, namely: food crop production, number/percentage of poor people, the nutritional status of underweight children and stunting. The study showed that the policy makers can anticipate the possibility poverty pocket, underweight and stunting problems on children under five before it actually occurs using FSVA. The results showed that a city/district with highest priority (ranking) on the FSVA most likely to be the locations with high poverty rate, malnourish and stunting children, and also low ability to produce food. Based on the Banten Province FSVA, the regions that need special attention is Kota Serang (Priority 4), relatively to other cities/districts (Priority 5-6).

Keywords: FSVA, Banten province, childhood malnutrition, underweight, stunting.

1. Introduction

The constitution number 18 of 2012 concerning Food defines the definition of food security, namely the fulfilment of food for the state to individuals, which is reflected in the availability of sufficient food, both in quantity and quality, safe, diverse, nutritious, equitable and affordable and does not conflict with religion, beliefs and culture of the community to be able to live healthy, active and productive in a sustainable manner. Meanwhile, food insecurity according to the American Institute of Nutrition is defined as the limitation or uncertainty of the availability of sufficient, nutritious and safe food, the inability to obtain food that is acceptable in a socially acceptable manner [1].

Food insecurity has been associated with a wide variety of adverse health and development outcomes in children and adults, both nutritional and non-nutritional. Food insecurity is associated with a prevalence of inadequate intake of key nutrients [2].

Results from a longitudinal study of welfare recipients in the United States indicate that household food insecurity is associated with poor physical and mental health of low-income black and white
women\textsuperscript{1}. Food insecurity is also associated with more behavioural problems worse school performance, and adverse health outcomes in children\textsuperscript{2}. Based on the Food Security and Vulnerability Atlas (FSVA) 2018 sourced from the Food Security Agency of the Ministry of Agriculture, Banten Province is included in priority category 5, which means that Banten Province is in the food resistant category\textsuperscript{3}. FSVA is a thematic map depicting geographic visualization of the results of data analysis of vulnerability indicators to food insecurity which is a derivative of three aspects of food security, food availability, food affordability, and food utility \cite{3}. The maps are made using a uniform colour pattern, namely gradations of red and green. The red colour gradation shows the variation in the level of food insecurity and the green gradation represents a better condition. The darker colour indicated a higher level of food security or insecurity.

So the formulation of the problem of this research is: could the FSVA map be used in more detail and operationally to detect which areas (cities/regencies) might have problems of poverty, malnutrition and stunting in Banten Province?

2. Methodology
This paper was a quantitative study. The condition of food security in Banten Province, seen from the food security and insecurity map (FSVA), was analyzed in relation to the amount of food crop production, poverty level, and community nutritional status at the City/Regency level based on secondary data from Central Bureau of Statistics (BPS) Banten Province and the Food Security Agency of the Ministry of Agriculture of the Republic Indonesia in 2018 \cite{4}. Analysis used manual correlation with data processing tools in the form of Ms Excel 2018. Analysis of the correlation between the pre-determinant variables (variables that can be calculated before the incident) where in this study the variable was the level of food security (FSVA) for each City/Regency as the predetermining variable 1 (X11) in the form of raw FSVA score and variables pre-determinant 2 (X12) was the rank or FSVA food security rank against 5 ex-post variables (variables that are known after the incident) in this study, namely: total food crop production (X2) per city/district in Banten Province, total population poor (X31), Percentage of poor people (X32), nutritional status of children under five who experience underweight (X41) and stunting (X42). We expected that the results of this study will make easier for policy makers to create programs that are able to anticipate and answer real problems on a targeted basis related to food insecurity, poverty and health.

![Figure 1. The Framework of Study](image-url)
3. Result and discussion

3.1. The concept of food security and nutrition is based on the world food program

The Government of Indonesia, through the support of the World Food Program (WFP) who was chaired by the President of the Republic of Indonesia with the secretariat at the Food Security Agency (BKP) created a Food Insecurity Map (FIA). The map in 2005 changed its name to the second volume of FSVA map in 2009, analysis and mapping was carried out on food and nutrition security and vulnerability described in the Food and Nutrition Security Framework (Figure 2) [5].

![Figure 2. Food Security and Nutrition Concept Framework (Source: World Food Program, 2009)](image)

The indicators chosen in this FSVA relate to the three pillars of food security based on the concept of food security and nutrition, namely aspects of food availability, food access and food utilization. The FSVA was developed using 9 indicators of chronic food insecurity and 4 indicators of temporary/transient food insecurity. The indicators compiled on the FSVA map according to WFP are shown in Table 1.
Table 1. Indonesian Food Security and Insecurity Map Indicators

| Aspect                      | Indicators                                                                 |
|-----------------------------|-----------------------------------------------------------------------------|
| Food Availability           | 1. The ratio of per capita normative consumption to the availability of      |
|                             |   rice, maize, cassava, sweet potato                                          |
| Food and Livelihood Access  | 1. Percentage of population living below the poverty line                    |
|                             | 2. Percentage of villages that do not have adequate connecting access        |
|                             | 3. Percentage of households without access to electricity                    |
| Food Utilization            | 4. Life expectancy at birth                                                  |
|                             | 5. Underweight toddlers                                                      |
|                             | 6. Illiterate women                                                          |
|                             | 7. Percentage of households without access to clean water                     |
|                             | 8. Percentage of households that live more than 5 km from health facilities  |
| Vulnerability to Transient  | 9. Natural disasters                                                         |
| Food Insecurity             | 10. Rainfall deviations                                                      |
|                             | 11. Percentage of puso areas                                                 |
|                             | 12. Forest deforestation                                                     |

Source: WFP, 2009

3.2. Food Security and Vulnerability Atlas (FSVA) Banten Province

Banten Province is considered small as a province compared to other provinces in Indonesia. The characteristics of the Banten region which are strategically located at the entrance to Java island from the direction of Sumatra island and close to the nation’s capital are factors that support the development of natural resource management. This is related to the distribution of natural resources results that can be faster. Thus, the existence and preservation of available natural resources must be maintained in addition to optimizing their use.

Based on the Food Security and Vulnerability Atlas (FSVA) 2018 sourced from the Food Security Agency of the Ministry of Agriculture, Banten Province is included in priority category 5. When compared to other provinces on the island of Java, Banten is in the priority 5 or food resistant category. East Java Province is in the most food resistant category which is in priority 6. Central Java and Yogyakarta provinces are in priority 5-6, West Java province is in priority 4-6, DKI Jakarta is in priority 6. In comparison, several provinces in Sumatra are in priority 3-4 such as the Bangka Belitung Islands and the Riau Islands. Meanwhile, most of the eastern parts of Indonesia, such as Papua, or more than 50%, are in a condition of food vulnerability or priority 1 [3]. Generally, it means that Banten Province is in the food resistant category.

Based on the FSVA map, most or more than 75% of the area in Banten Province was in the light green zone or priority 5, which means that the food security condition in Banten Province is in moderate food resistance category.

Data on the food security index from the Food Security Agency of the Ministry of Agriculture [6], the scores and rankings of regencies and cities in Banten Province could be described in Table 2. Based on the FSI data, it can be seen that the lowest score is owned by the City of Serang with an FSI value of 59.16 which included in priority group 4 (low food resistance category). Meanwhile, other areas fall into the high to very high category of food resistance [6].
Table 2. Scores and Rank of Regencies and Cities in Banten Province based on the Calculation of Food Security Index (FSI)

| Regencies/Cities    | Scores | Rank  |
|---------------------|--------|-------|
| Serang City         | 59.16  | Priority 4 |
| Cilegon City        | 68.72  | Priority 5 |
| Pandeglang Regency  | 70.42  | Priority 5 |
| Tangerang Regency   | 71.10  | Priority 5 |
| Lebak Regency       | 71.63  | Priority 5 |
| Serang Regency      | 75.58  | Priority 5 |
| Tangerang City      | 76.84  | Priority 6 |
| South Tangerang City| 83.33  | Priority 6 |

Source: Food Security Council, Ministry of Agriculture 2018

Serang City as the capital of Banten Province had the lowest score compared to cities/regencies in Banten Province for the food security index. This means that the FSI of Serang City is under the composite FSI of Banten Province as a whole. This shows that there are still several indicators from the aspect of food security in the region that have not shown good quality.

Based on the data in Table 3, it showed that urban areas will have lower levels of food production when compared to regencies in Banten province. Food security in rural areas will depend more on production while in urban areas it will depend on wage and employment levels [8]. If we compare the level of food crop production in various cities and districts in Banten Province, Pandeglang Regency had the highest plant production levels in 2017 and 2018 compared to other regions [7]. This means that from the aspect of food availability, Pandeglang Regency has quite high food availability. One aspect of the FAO food security index assessment is the aspect of food availability. Sufficient and high food availability will certainly increase the food security of the region.

Food security in urban areas will depend on the level of wages and jobs. The level of wages and jobs will affect the purchasing power of the community, the higher the wage level, the higher the purchasing power of an individual or household, conversely, the lower the wage, the lower the purchasing power of an individual or household. This will impact poverty. This means that poverty will affect purchasing power or it can be said that the accessibility of the ability to buy food will be very low. The data in Table 4 shows the level of poverty in Banten province from the highest based on the percentage to the lowest [8].
Based on the data in Table 4, it showed that Pandeglang Regency is the area in Banten Province with the highest percentage of poor people compared to other areas in Banten Province followed by Lebak Regency and Serang City, while South Tangerang City had the lowest percentage of poor people in the Banten Province. It can be seen that even though Pandeglang Regency has the highest level of food production in the entire Banten province, it did not guarantee a high level of welfare either and the poor will be vulnerable to food insecurity. According to data from the world food program, poverty in Indonesia is concentrated in rural areas, where 14.3 percent of the population live below the poverty line [9]. Access to food is also uneven, and influenced by factors like poverty and lack of infrastructure. High food prices with rice being 50 to 70 percent more expensive than in neighbouring countries compound the situation. As a result, 19.4 million people are unable to meet their dietary requirements [9].

The data in Table 4 shows that Pandeglang Regency has the highest percentage of poor people [10]. The higher the poverty level, the lower the level of food security in the region, because it means that the accessibility of individuals or households to the ability to buy food would also be lower. Accessibility to food is one of the aspects of food security according to FAO which is used to calculate the Food Security Index, which means that the lower the food accessibility of a region or household, the higher the level of food insecurity, this will result in the level of food security in the region being increasingly low. On the other hand, Kota Tangerang Selatan had the lowest percentage of poor people compared to other areas in Banten Province. This showed the accessibility of the ability to purchase foodstuffs will also be higher. High food accessibility will increase high food security and reduce the level of food insecurity in the region.

Table 3. Production of Food Crops in Banten Province from the Highest to the Lowest Production per City/Regency (2017-2018)

| City/Regency       | Production 2017 (Tons) | Total Production (2017) |
|--------------------|------------------------|-------------------------|
|                    | Rice | Maize | Soybeans | Nuts | Tubers |                   |
| Pandeglang Regency | 789,311 | 41,418 | 1,636 | 314.12 | 25,794 | 858,473.12 |
| Lebak Regency      | 608,036 | 17,678 | 264 | 329.99 | 31,906 | 658,213.99 |
| Serang Regency     | 506,892 | 3,341 | 149 | 756.53 | 23,198 | 534,336.53 |
| Tangerang Regency  | 410,535 | 184 | 0 | 39.00 | 3,163 | 413,921.00 |
| Serang City        | 81,996 | 669 | 69 | 1,912.67 | 9,194 | 93,840.67 |
| Cilegon City       | 13,277 | 70 | 0 | 2,510.16 | 1,322 | 17,179.16 |
| Tangerang City     | 3,001 | 0 | 0 | 0.00 | 98 | 3,099.00 |
| South Tangerang City | 432 | 157 | 7 | 86.47 | 1,534 | 2,216.47 |

| City/Regency       | Production 2018 (Tons) | Total Production (2018) |
|--------------------|------------------------|-------------------------|
|                    | Rice | Maize | Soybeans | Nuts | Tubers |                   |
| Pandeglang Regency | 449695 | 222374 | 14115 | 462.96 | 36349.49 | 722996.45 |
| Lebak Regency      | 378079 | 98431 | 3375 | 265.24 | 33051.16 | 513201.40 |
| Serang Regency     | 419228 | 8456 | 601 | 1020.86 | 18879.99 | 448185.85 |
| Tangerang Regency  | 316152 | 252 | 0 | 54.00 | 4091.98 | 320549.98 |
| Serang City        | 67726 | 713 | 1 | 1698.21 | 3989.56 | 74127.77 |
| Cilegon City       | 8284 | 1475 | 1 | 1784.92 | 1071.30 | 12616.22 |
| Tangerang City     | 3867 | 0 | 0 | 0.00 | 100.46 | 3967.46 |
| South Tangerang City | 15 | 164 | 2 | 36.00 | 1578.55 | 1795.55 |

Source: BPS, Banten Province (2018-2019)
### Table 4. Number and Percentage of Poor Population in Banten Province from Highest to Lowest per City/Regency

| City/Regency     | Number of Poor Population (thousand) | Percentage of Poor Population |
|------------------|--------------------------------------|-------------------------------|
|                  | 2017       | 2018     | 2017       | 2018       |
| Pandeglang Regency | 117.31    | 116.16   | 9.74       | 9.61       |
| Lebak Regency     | 111.08    | 108.82   | 8.64       | 8.41       |
| Serang City       | 36.97     | 36.21    | 5.57       | 5.36       |
| Tangerang Regency | 191.62    | 190.05   | 5.18       | 5.18       |
| Serang Regency    | 69.10     | 64.46    | 4.63       | 4.30       |
| Tangerang City    | 105.34    | 103.49   | 4.95       | 4.76       |
| Cilegon City      | 14.89     | 13.96    | 3.52       | 3.25       |
| South Tangerang City | 28.73    | 28.21    | 1.76       | 1.68       |

Source: BPS, National Socio-Economic Survey (2017-2018)

3.3. Toddler Nutritional Status (Underweight and Stunting) in Banten Province

One of the indicators from the aspect of food use in analyzing the Food Security Index is the percentage of children under five who are underweight or stunted. The stunting indicator shows the individual's ability to absorb nutrients efficiently by the body, which is an indicator of the aspect of food utilization to increase food security. The data in Table 5 shows the percentage of children under five who are underweight and stunting in Banten Province by City and Regency.

Table 5 showed that the highest percentage of underweight children under five was Serang district at 26.8%, while the percentage of children under five with stunting was Pandeglang. The Ministry of Health [11] in a pocket book on monitoring nutritional status in 2017 explained that the condition of underweight toddlers is a term for toddlers who experience a combination of malnutrition and malnutrition, while the term stunting is defined as the condition of toddlers with a combination of very short/short.

Based on the categorization of community nutrition problems based on WHO standards, an area is categorized as good if the prevalence of stunting is less than 20% and the prevalence of underweight children is less than 5%. When viewed from the WHO standard, it means that the nutritional condition of children under five in the entire Banten region is in the category of chronic acute nutrition problems.

One of the indicators of food security from the aspect of food utilization based on FAO [12] is the percentage of children under five who are stunted. This means that the higher the percentage of children under five with stunting in an area, the lower the level of food security in that area, and conversely the lower the percentage of children under five with stunting in an area, the higher the food security in that region. This shows that the ability of individuals in this case to absorb nutrients efficiently by the body in all areas of Banten province is very low. The low ability of this individual is very much influenced by purchasing power or it can also be caused by the low knowledge of the mother or the head of the family regarding nutrition.

#### Table 5. Percentage of Toddlers Experiencing Underweight and Stunting in Banten Province by City/Regency (2017)

| City/Regency     | Percentage of Underweight | Percentage of Stunting |
|------------------|---------------------------|------------------------|
| Pandeglang Regency | 22.6                     | 37.8                   |
| Lebak Regency     | 23.0                      | 37.3                   |
| Serang Regency    | 26.8                      | 34.3                   |
| Serang City       | 18.5                      | 31.7                   |
| Tangerang Regency | 17.8                      | 28.8                   |
| South Tangerang City | 16.7                    | 23.9                   |
| Tangerang City    | 17.8                      | 23.3                   |
| Cilegon City      | 15.4                      | 20.8                   |

Source: Ministry of Agriculture (2017)
3.4. Relationship between FSVA Indicators and Food Production, Poverty Problems and Nutritional Status of Toddlers

The results of the correlation analysis between the predetermined variables, namely the food security score (X11) and the food security rating (X12) with the exante variable, are events / problems that can only be measured after they occur, namely: food production (X2), the number of poor people (X31). The percentage of poor people (X32), the percentage of underweight children underweight (X41) and the percentage of children under five with stunting (X42) can be seen in Table 6.

| FSVA | X2  | X31 | X32  | X41 | X42 |
|------|-----|-----|------|-----|-----|
| X11  | 0.069 | -0.396 | -0.356 | -0.016 | -0.317 |
| X12  | 0.267 | -0.409 | -0.411 | -0.254 | -0.254 |

Where:

- X11 = Food security score
- X12 = Food security rank
- X2 = Food production (ton)
- X31 = Number of poor people (people)
- X32 = Percentage of poor people (percent)
- X41 = Percentage of underweight children (percent)
- X42 = Percentage of children under five with stunting (percent)

The results of the analysis showed that there was a weak to moderate correlation between the FSVA indicator and the occurrence of exante events (5 variables), which can only be known after the problem/event occurs. In general, the FSVA indicator in the form of Rank / Category (X12) had a higher correlation with a value between |0.254| to |0.411| compared to the FSVA indicator in the form of a score (X11) with a value between |0.069| to |0.396|. Meanwhile, the correlation between the FSVA indicator in the form of rank (X12) and score (X11) was consistent.

The correlation between the FSVA indicator and the level of production (X2) was positive, meaning that if the score / rank is higher, the level of food production will also be higher. Meanwhile, the correlation between the FSVA indicator and the number (X31) and the percentage (X32) of the poor population was negative, meaning that if the score / rank is higher, the number and percentage of poor people will be found to be less.

Likewise, the correlation between the FSVA indicator and the percentage of underweight children (X41) and the percentage of toddlers with stunting (X42) was negative, meaning that if the FSVA score / rank was higher, the percentage of underweight and stunting toddlers would be found less. However, the correlation value between the FSVA score and the percentage of toddlers with stunting (X42) was higher than the percentage of underweight children (X41). Meanwhile, the correlation value between the FSVA Rank and the Percentage of Underweight (X41) and Stunting (X42) Toddlers was the same (-0.254).

According to research result by Zhihui Li [13], the remaining 17 indirect factors included household socioeconomic status (household wealth, maternal and paternal education), parents’ nutritional status (maternal and paternal height and BMI), maternal autonomy (for health care, movement, and money), environmental conditions (water source, sanitation facility, and stool disposal), maternal reproductive care (antenatal care, skilled birth attendant at delivery, family planning needs), and maternal marriage age. Prior studies have indicated that household wealth, maternal characteristics, and household environment are strongly associated with child anthropometric failures [13].
4. Conclusion.
This study showed that it can be a convenience for policy makers to anticipate the possibility of poverty and underweight and stunting problems in children under five in a province before it actually occurs using FSVA. The results of the analysis also show that the Level of Priority 1-6 (Ranking) of Food Vulnerability in the FSVA is generally better used for reference than the raw score value. This study shows that the City / District areas in the FSVA with Priority (Ranking) 1 are most likely to be locations where the poverty rate is high (Prob. low ability to produce food (Prob. 27%)). Based on the FSVA ranking of Banten Province, the regions that need special attention because of the possibility of high levels of poverty, underweight and stunting underweight are the regions with the highest ranking, namely Kota Serang (Priority 4), compared to other cities/regions (Priority 5-6).

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