RESEARCH ARTICLE

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# The Movement to Maintain Food Security Through Technological Advancements and Local Diversification: Ministry of Agriculture Republic of Indonesia

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**ABSTRACT**

This study aims to determine the food security movement using a qualitative descriptive research method assisted by NVivo 12 Plus software from the Twitter account data source of the Ministry of Agriculture Republic of Indonesia, supported by previous research. Data coding was obtained from Twitter, social media, and news data, which supported the findings using a crosstab query feature. The analysis found that the government's strategy for maintaining food security was to increase production capacity, diversify local food, strengthen food reserves and logistics systems, and develop modern agriculture. They increased food production by intensifying 85,456 hectares of swamp land and maximizing 85,456 hectares of land. Diversifying local food by massively utilizing local food as an alternative food supply and strengthening food reserves and logistics systems by supporting food reserves that can be used to help other areas affected by disasters as a form of social care, and developing modern agriculture with Smart Farming Developing technology-based clever farming methods, including Agri Drone Sprayer liquid, Surveillance Drones (drones for land mapping), Soil and Weather Sensors, as well as the development of food safety applied to households. Scale with vertical hydroponic growing system training.

## Introduction

Food is a basic need for humans as a source of livelihood in supporting the entire range of daily life activities [1]. Fulfilling food needs is part of the fulfillment of human rights for every Indonesian citizen to form quality human resources that can increase competitiveness between nations in the international world [2]. Expanding the fulfillment of food needs is an effort to improve the quality of human resources by providing nutritious substances [3]. Food security is both safe and prosperous order [4]. Food security is at the center of international development to achieve health facilities and fulfillment [5]. Food security in fulfilling good nutrition involves the household sector with various mobilizations of agricultural instruments [6]. The development and defense of food security requires stabilization of changes and effects [7]. Food security is maintained through good access to sufficient, safe, nutritious, and equitable food [8]. A food security program is a food stabilization strengthening program that has a long-term impact on human life [9].Food security is an economic dimension that cuts the world's poverty chain and strengthens local economies [10]. Social size plays a role in building community togetherness and realizing global food security [11]. Reliable

food defenses can create healthy and high-quality human resources [12]. Each country's food security is successful in maintaining its life stability and a state of peace in supporting its quality [13].

Food security that is safe and guaranteed in a country is a form of sovereignty for independent nations [14]. The success of human development has led to the realization of a peaceful and prosperous society [15]. Food security is a global issue that is an integral part of a country's development and is listed at several points in the Sustainable Development Goals (SDGs) agreed upon by the United Nations Development Program in 2015 related to the eradication of hunger [16].The government's role in optimizing the production of food products that impact all circles of society, especially the lower-middle class, is to meet the needs of daily life [17]. Indonesia is the dominant country in the agricultural sector and a significant asset in ensuring people's lives, supported by a strong spirit of cooperation in maintaining survival [18]. The development of times that have changed provides space for movement or patterns for the Chinese system in Indonesia [19]. Changing times have triggered the Indonesian government to maintain food quality and quantity [20]. Strategies through planning, implementation, and evaluation continue to be improved to maintain food sovereignty as an agrarian country by structuring the food sector for all Indonesians based on the performance of appropriate policies [16]. Policies to maintain food security require support from all sectors [21]. Food security is a model that improves people's lives and provides opportunities to develop the potential of local communities [22].

The Covid-19 pandemic has hurt food security, as evidenced by the decline in food production [23]. The shocks caused by the Covid-19 pandemic disrupted economic activity and reduced the supply of agricultural income [23]. The impact of the Covid-19 pandemic has reduced the effects of food availability with various limitations [24]. Therefore, this research focuses on the movement to maintain food security by analyzing the Twitter account of the Ministry of Agriculture Republic of Indonesia in data disclosure to ensure food improvement by focusing on aspects of increasing production capacity, diversifying local food, strengthening food reserves and logistics systems, and developing modern agriculture [12]. The results of previous research show that (1) the concept and understanding of food security develops according to the complexity of the problem over time; (2) the dimensions of food security are vast, so many indicators are needed to measure it; and (3) to achieve food security, food availability and ownership need to be considered, and a new paradigm is needed [25].

The novelty of this study lies in the results of data analysis and management as measured by the NVivo 12 Plus analysis, which results in newness in the technology of discovery and research results. NVivo 12 Plus is unique software for valuable qualitative data analysis in food security research. NVivo facilitates the organization of data with a structured structure, enabling the categorization of information, coding, and connection of different concepts to understand the relationships between data elements. This helps researchers analyze information more efficiently. NVivo 12 Plus supports data integration and allows researchers to combine qualitative and quantitative data. This provides a more comprehensive view of the food security issues. Overall, NVivo 12 Plus or similar software is a useful tool for researchers working on food security research, helping them manage, analyze, and present relevant qualitative data more effectively. This study adopted a qualitative descriptive research method supported by NVivo 12 Plus software to analyze data from the Twitter account of the Ministry of Agriculture Republic of Indonesia . This method contributes to food security analysis, and demonstrates how modern technology can be used in social research. The analysis in this study provides valuable insights into government strategies for maintaining food security. This study identified several necessary actions taken by the government, such as increasing production capacity, diversifying local food sources, strengthening food reserves, and developing modern agriculture. This information provides a deeper understanding of the government's efforts to address food security issues.

## Method

This study used a descriptive qualitative approach to depict and assess the findings meticulously [26]. Efforts to enhance food quality by focusing on aspects such as expanding production capacity, diversifying local food, bolstering food reserves, and advancing modern agriculture have been upheld by analyzing data disclosure from the Ministry of Agriculture Republic of Indonesia 's Twitter account [12]. Using NCapture from NVivo 12 Plus with Web Chrome, the data analysis process involved extracting information from the Twitter account of the Ministry of Agriculture Republic of Indonesia. The Cross Tab function automatically conducts primary statistical tests to ensure valid comparisons and indirect variable analyses [27]. The Crosstab Query function was employed to incorporate code (manual or generated), textual data, and numerical data into the variables and pattern data. In this phase, the Twitter account of the Ministry of Agriculture Republic of Indonesia was scrutinized to facilitate automatic calculations, encompassing all data aspects related to the efforts in

upholding food security during the Covid-19 era. The Word Cloud tool can swiftly identify words within data findings or frequently visualize recurring terms. The data were collected between August 2020 and June 2022. The information is backed by various news reports and different types of literature that examine the Twitter account of the Republic of Indonesia's Ministry of Agriculture to uncover trends in sustaining food security. The results of data analysis and management, as measured by the NVivo 12 Plus analysis, which generates marvels in discovery technologies and research results, make up this innovative study's findings. This study describes and assesses the Indonesian government's strategy to increase food security. This is important because food security is crucial to people's welfare and economic stability.

## Results and Discussion

They have focused on augmenting production capacity, diversifying local food options, fortifying food reserves and logistics systems, and advancing modern agricultural practices to enhance food quality. To achieve this, they analyzed the Twitter account of the Ministry of Agriculture Republic of Indonesia to disclose relevant data [12]. The mechanism for implementing food security policies is a strategy for finding solutions for people's livelihoods [28]. Food security is a strategy that can meet people's needs to fulfill their sense of security and prosperity in social life [9]. Reliable human resources can be viewed as a country's ability to meet the needs of people's lives, starting with the adequacy of meeting the needs of clothing, food, and housing [29]. Food security is an economic dimension that cuts the world's poverty chain and strengthens local economies [10]. Social size plays a role in building community togetherness and realizing global food security [30]. Reliable food defenses can create healthy and high-quality human resources [31]. Each country's food security is successful in maintaining its life stability and a state of peace in supporting its quality [32]. Changing times have triggered the Indonesian government to maintain food quality and quantity [20]. Strategies through planning, implementation, and evaluation continue to be improved to maintain food sovereignty as an agrarian country by structuring the food sector for all Indonesians based on the performance of appropriate policies [16].

Disruption of agricultural production due to restrictions on the movement of people/labour, decreased purchasing power of people on demand for farm products, disruption of food distribution due to the implementation of restrictions, and limited area closures; farmers are vulnerable to being exposed to Covid-19 which has the potential to cause a food crisis [33]. Data analysis using NVivo 12 plus software revealed that the results of aspects of increasing production capacity with a percentage of 24%, local food diversification with a rate of 26%, strengthening reserves and food logistics systems with a percentage yield of 23%, and development of modern agriculture with a percentage yield of 25%. The analysis findings illustrate the government's endeavors to uphold food security during the Covid-19 period. These efforts were based on data analysis disclosed through the Twitter account of the Ministry of Agriculture Republic of Indonesia to ensure food improvement. The results of this analysis are shown in Figure 1.
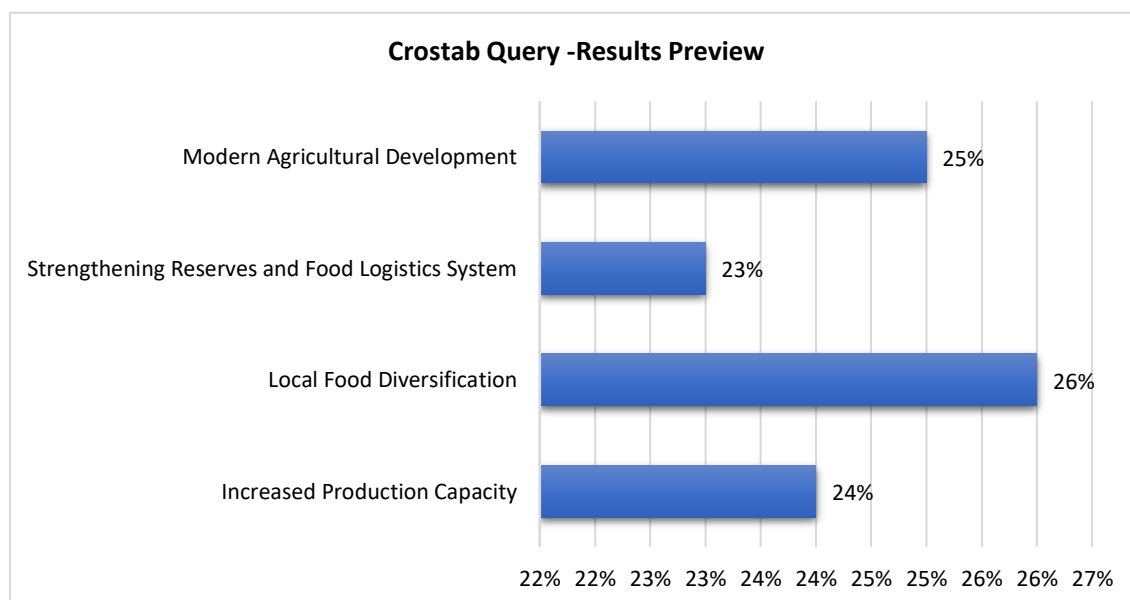


**Figure 1.** Crostab query Nvivo 12 Plus analysis presentation results based on research findings.

**Increased Production Capacity**

They have enhanced production capacity, as evidenced by the percentage of 24% from the NVivo 12 Plus examination. The findings of this study support the claim made by the Minister of Agriculture, Syahrul Yasin Limpo, that Covid-19 had wreaked havoc in all spheres of life. Several people's economic activities have ceased, services have been hindered, and the agricultural sector has had a reasonably significant impact. More significant issues were found in marketing and distribution systems. To support the National Food Security Movement, the Minister of Agriculture exhorts farmers and extension personnel accelerated the planting. All business sectors, especially the agricultural industry, have experienced economic disruption owing to the Covid-19 outbreak [23]. The fulfillment of food needs is an essential factor in every individual's life in every country [34]. Food security is part of the development of sovereign nations [35]. Human resource development involves efforts to fulfill basic human needs to eradicate hunger [13].

Food security is inseparable from the ability of a community to receive access to food needs [36]. Food security development aims to enhance food security and sustain agricultural revitalization to achieve food self-sufficiency. It also involves enhancing the competitiveness of agricultural products, increasing farmers' incomes, and safeguarding the environment and natural resources [37]. All parties must support the Food Security Movement launched by the Ministry of Agriculture in response to the present coronavirus threat, particularly farmers and extension personnel who serve as the leaders and propulsion force of the agricultural industry [24]. The Ministry of Agriculture urged agricultural stakeholders to accelerate rice cultivation in Season II 2020, covering a total area of 6.1 million hectares (ha). Additionally, they encouraged the development of swampland in Central Kalimantan Province, covering an area of 164,598 ha. This development will intensify 85,456 ha of wetlands and extend 79,142 ha of agricultural land [33].

Improved production capability to meet import demands by rapidly planting and expanding planted areas, the development of approximately 164,598 ha of swampland in Central Kalimantan, and increased production of sugar, cattle, and garlic [38]. The Director-General of Food Crops Suwandi [39], stated that in the second planting season (MT-II), or from April to September 2020, rice planting is planned in an area of 5.6 million ha with a target range of 12.5 million tons to 15 million tons of rice. His party worked directly in the field to achieve the planting target, driving the acceleration of tillage and planting even on holidays. Meanwhile, Suwandi said that rice production experienced a surplus from the harvest carried out from January to June. According to him, the stock of rice by the end of June will reach 7.4 million tons [39].

Efforts are being made to maintain food security by using swamplands to meet essential food needs. The Head of the Food Security Agency Ministry of Agriculture, Agung Hendriadi [40], said that this year, he targeted the intensification of swampland covering an area of 85,456 ha in Central Kalimantan. Agricultural intensification aims to maximize existing land and increase agricultural yields using various means [41]. By maximizing the current land area to 85,456 ha, the Ministry of Agriculture will expand the land to 79,142 ha [40]. In the National Economic Recovery Strategy, the Ministry of Agriculture will develop a new land area of 250 thousand ha with a significant expansion of rice, corn, onion, and red chili producing areas in deficit areas and increasing sugar, beef, and garlic production to reduce imports [42]. Strategies to improve food security will impact meeting the food needs of the community and fulfilling national food needs [43].

**Local Food Diversification**

Using NVivo 12 Plus and the Crosstab Query tool, the analysis yielded 26%, highlighting the significance of diversification as a strategy for safeguarding local food security. This approach involves concentrating on a single primary product within a specific region or province and utilizing yards and marginal land by implementing the Sustainable Food Garden program. Regional food diversification was developed based on local wisdom [38]. Achieving successful food security by halving people living in extreme hunger and poverty [44]. The success of food security is a manifestation of the planning to create a food security society [41]. Food insecurity at the national level can be caused by an inability to produce food products and a country's inability to import food [45]. At the regional (provincial and district) level, food insecurity can occur because of insufficient production or the inability of food to reach remote areas at affordable prices [46].

The Ministry of Agriculture fosters food diversification based on local knowledge and a single primary commodity. Instead of replacing rice, food diversification aims to improve and shift the dietary habits. There are more dietary options with higher nutritional standards [42]. Based on local knowledge and concentration on a primary commodity, the Ministry of Agriculture encourages local food diversification. For example, 35,000 ha of cassava, 50,000 ha of corn for food, 1,000 ha of sago, 1,300 ha of bananas, 650 ha of potatoes, and 5,000 ha of sorghum are used extensively [42]. Food diversification attempts to prepare for disasters,

offer alternatives to staple foods, advance the economy, and develop healthy people's resources to reduce reliance on rice consumption [47]. Food is a basic need for humans as a source of livelihood in supporting the entire range of daily life activities [17]. Fulfilling food needs is part of the fulfillment of human rights for every Indonesian citizen to form quality human resources that can increase competitiveness between nations in the international world [2]. Food security is at the center of international development to achieve health facilities and fulfillment [48]. Food security in fulfilling good nutrition involves the household sector with various mobilizations of agricultural instruments [43]. The development and defense of food security requires stabilization against changes and effects [49].

The Ministry of Agriculture ensures that the food needs of 267 million Indonesians must be fulfilled. Therefore, diversification can improve food security [23]. Over the next five years, the Ministry of Agriculture targeted a 7 percent reduction in national rice consumption. In 2020, the average rice consumption was expected to decrease to 92.9/kg per capita per year from the previous year's position of 94.9/kg per capita per year [50]. The potential productivity of cassava can reach 10 tons per hectare, and that of banana can reach 80 tons per hectare. Furthermore, it is necessary to encourage the market to introduce local food products and images to attract consumers [16]. Medium- and long-term strategy to increase local food diversification that emphasizes meeting people's food needs [51]. Currently, each province focuses on producing foods other than rice. There are six food commodities: cassava, corn, sago, bananas, potatoes, and sorghum [39]. Encouragingly, there is a consistent drive to promote food diversification in various regions, transforming food diversification into a widespread movement. This is further reinforced by the use of yards and marginal land to implement the Sustainable Food Garden program, benefiting 3,876 groups [40].

### Strengthening Reserves and Food Logistics System

By scrutinizing the Twitter account of the Ministry of Agriculture Republic of Indonesia for data disclosure, the results revealed a percentage of 23%, indicating the significance of strengthening reserves and food logistics systems to stabilize food supply and prices. Through this approach, we actively support the government's endeavors to uphold food security during the Covid-19 period while striving for continuous food improvement [38]. Strengthening reserves and food logistics systems will be achieved by bolstering the rice reserves of provincial and district/city governments [33]. By bolstering government rice reserves in provinces, districts, cities, or regions, the Ministry of Agriculture supports food reserves and logistical systems, preserves food supply, and stabilizes food prices. Strengthening government rice reserves in the province, districts, towns, or regions helps the Ministry of Agriculture to support food reserves and logistical infrastructure so that there is a steady supply of food and prices [42]. The success of a country can be seen in the quality of life of its entire community [12]. The instability of national rice can cause turmoil in various social, political, and economic [3]. The role of food commodities in the poverty line is much more significant than that of non-food commodities such as housing, clothing, education, and health. Rice has the most critical influence on the value of the poverty line [1]. Rice food security is an essential commodity, especially for the poor and for the formation of high-quality human resources [51].

Strengthening the government's rice reserves in cities and districts currently has 5,328 community food barns spread across 33 provinces [42]. The Minister of Agriculture, Syahrul Yasin Limpo, emphasized his commitment to guaranteeing food access for the community under any conditions, including providing food amid frequent disasters to strengthen national food reserves and encouraging local governments to participate in maintaining the food reserves of their respective regional governments [42]. The Head of the Food Security Agency, Agung Hendriadi [40], assessed that the provincial government's food reserves could meet the food needs of the people affected by the disaster so that they can be distributed more quickly to the location of the disaster. The Head of the Audit Board of Indonesia Food Distribution and Reserve Center, Risfaheri [52], explained that throughout January 2021, the Regional Government Food Reserve rice was distributed by the Office in charge of Food Security in the Provinces of West Sumatra, South Kalimantan, and Jambi for communities affected by floods.

Regional Government Food Reserves play a strategic role in food supply, especially during disasters in several parts of Indonesia in early 2021. It also strengthens national food reserves [44]. Government Food Reserves can be used as a form of social awareness to help other disaster-affected areas. As has been done by the Office that handles Food Security in the Provinces of Central Java and East Kalimantan, it has distributed rice to help communities affected by the earthquake in West Sulawesi and South Kalimantan [33]. Given the importance of strengthening food reserves, the Ministry of Agriculture supports them by advocating for local governments. To date, 300 Regional Governments have allocated Local Government Food Reserves, with 31 provincial and 269 regency/city governments [38].

**Modern Agricultural Development**

The progress of modern agriculture is evident in the NVivo 12 Plus analysis findings, which reflect the government's endeavors to sustain food security during the Covid-19 period. These efforts involved examining the data disclosed through the Twitter account of the Ministry of Agriculture Republic of Indonesia to ensure food improvement, with results revealing a percentage of 25%. The development of food security aims to enhance food security, foster agricultural revitalization, achieve food independence, enhance the competitiveness of agricultural products, increase farmers' incomes, and safeguard the environment and natural resources [52]. Quality human resources are driven by the ability of humans to obtain adequate and healthy food [53]. A reliable state can regulate society and ensure the fulfillment of the basic needs of every community [54]. Food security is a strategy for creating sufficient food, overcoming hunger, and facilitating access to food [55]. Food security guarantees people's lives and minimizes poverty [23]. Policies to maintain food security require support from all sectors [56]. Food security is a model that improves people's lives and provides opportunities to develop the potential of local communities [17].

Examples of modern agriculture include the expansion of farmer corporations, adoption of innovative farming practices, utilization of screen houses to increase horticultural production beyond the regular growing season, establishment of food estates to cultivate premium food items, and advancement of screen house technology (rice/corn) [33]. Universities play a vital role in the development of modern agriculture because of smart farming, the product and utilization of screen houses, the development of food estates, and the development of farmer corporations [38]. The development of food security, modern agriculture, and smart farming is a technology-based intelligent farming method [57]. The technologies utilized in "Smart Farming 4.0" encompass drones known as "Agri Drone Sprayers" specifically designed for spraying pesticides and liquid fertilizers, "Surveillance Drones" drones that map the land, and "Soil and Weather Sensors" drones that monitor weather [7].

Various challenges within the Indonesian agricultural sector can be effectively addressed and resolved through the assistance of technology-driven smart agriculture, which has proven to be highly beneficial in agricultural systems, particularly amidst the Covid-19 pandemic [58]. During the Food Security Movement assessment, the Minister of Agriculture prioritized point four, which emphasized the advancement of modern agriculture. This entails the development of innovative farming practices, establishment and utilization of screen houses to enhance horticultural production beyond the regular growing season, promotion of farmer corporations, and establishment of food estates [59]. Various studies have shown that modern food systems are vulnerable to environmental and economic crises and do not always lead to the development of community resilience and welfare [6]. A less than optimal global agricultural system is the leading cause of the global food crisis [60]. It maintains food stability through technological methods developed by scientists in various international studies [61].

Development of food security applied at the household scale through training in viticulture hydroponic planting systems [59]. Food taste development in Central Kalimantan is for rice plants with a leading sector of the Ministry of Agriculture located on alluvial land covering an area of 165 thousand ha on Ex-Peatland Development land and cassava plants with a top industry of the Ministry of Defense covering an area of 60 thousand hectares [62]. The initial stage of work on food estates for rice plants covered an area of 32 thousand ha in October 2020. It consists of 30 thousand ha in a room with good rice fields and irrigation conditions, and 2,000 ha in the Dadahup District [62]. Rice plants began to repair irrigation canals and access roads to the food estate area in October 2020 [59]. The remaining 133 thousand ha will continue later in 2021, and by the end of 2021, the rice estate area of 165,000 ha will be completed physically and planting will start in 2021 [62]. Cassava plant food estate, Minister Basuki said, in 2020 of the total planned development areas of 60 thousand ha, 30,000 ha will be started in 2020–2021 in Gunung Mas Regency, Pulau Pisang Regency, and Kapuas Regency.

The remaining 30 thousand ha, most of which is in the Murung Raya Regency, will be implemented in 2021 [33]. The total 2020 agricultural development assistance in North Sulawesi was IDR 136.86 billion. The assistance included the development of 98,132 ha of corn, 6,153 ha of soybeans, 25,000 stems of early mature coconut seeds, 477,600 stalks of coconut, 431,250 stalks of nutmeg, 85,800 stalks of cloves, and the construction of a two-hectare nutmeg mother garden in North Minahasa [63]. The development of modern agriculture will increase food security, especially during food crises [57]. Moreover, the word cloud analysis revealed the most commonly used words in this study. The word cloud visually presents the hundred most frequently occurring words in the discussion, which are interconnected and are representative of the research results. The word cloud analysis is shown in Figure 2, displaying the selected hundred words. The

results of the NVivo 12 Plus analysis with the Word Cloud feature found the most popular words in the discussion of the results of the government's investigation of research on maintaining food security during the Covid-19 period by analyzing the Twitter account of the Ministry of Agriculture Republic of Indonesia in data disclosure to guarantee food improvement. The results of the data analysis show the ten most famous words in the discussion: agriculture, farmers, food, plants, @syahrul, Indonesia, improve, program, minister, and technology.



**Figure 2**. Word cloud analysis.

The analysis of the results of the word cloud is the result of a study that shows the relevance of the findings and the results of the investigation that show the suitability of the results of the analysis from the Twitter account of the Ministry of Agriculture in responding to research results in maintaining food security in the era of the Covid-19 pandemic. The results for the most popular word data are presented in Table 1.

**Table 1.** Word cloud data.

| Word | Length | Count | Weighted Percentage (%) |
|------|--------|-------|-------------------------|
| pertanian | 9 | 48 | 002 |
| petani | 6 | 34 | 002 |
| pangan | 6 | 30 | 001 |
| tanaman | 7 | 23 | 001 |
| @syahrul | 8 | 20 | 001 |
| indonesia | 9 | 20 | 001 |
| meningkatkan | 12 | 20 | 001 |
| program | 7 | 17 | 001 |
| menteri | 7 | 16 | 001 |
| teknologi | 9 | 14 | 001 |

The Word Could feature obtains the results of famous words from the discussion findings. The analysis results described the most common words used in the debate: agriculture, farmers, food, plants, @syahrul, Indonesia, improve, program, minister, and technology. The results are related to the finding that agriculture is an aspect of community needs that meets the needs of human life. Food development and security efforts are strategies to strengthen the fulfillment of food needs by integrating program policies from the government that involve technological sophistication. The outcomes of the word cloud analysis were derived from aligning research findings to sustain food security.

## Conclusions

This study revealed that the Ministry of Agriculture Republic of Indonesia has taken strategic steps to maintain and improve food security, including increasing production capacity, diversifying local food choices, strengthening food reserves and logistics systems, and developing modern agriculture. All of these steps are an integral part of the government's efforts to provide stable food and improve society's welfare and well-being. The agricultural and food sectors significantly affect a country's economic growth. Good food security

can increase agricultural production, create jobs, and increase farmers' income. This can also support related industries such as food processing and distribution. A stable food supply can prevent social tensions caused by hunger and food shortage. By understanding the importance of food security, governments and communities can collaborate to develop strategies to ensure adequate and sustainable food availability for all citizens.

## Author Contributions

**NH**: Conceptualization, Methodology, Writing - Review; **HW**: Conceptualization, Methodology, Writing - Review; **FPW**: Conceptualization, Writing - Review; **KA**: Investigation, Writing - Review; **H**: Investigation, Writing - Review & Editing.

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