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**MALAYSIA, INDONESIA AND THAILAND TRENDS ON FOOD SECURITY RESEARCH:  
ABIBLIOMETRIC ANALYSIS FROM 2003 TO 2022**

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Article Info	ABSTRACT
<p><b>Article history:</b></p> <p>Received: 18 Nov 2023 Revised: 16 Dec 2023 Accepted: 3 Jan 2024 Published: 1 April 2024</p> <p><b>Keywords:</b></p> <p>food security, food insecurity, bibliometric analysis, Malaysia, Indonesia, Thailand</p> <p> OPEN ACCESS</p>	<p>Food security encompasses the availability, accessibility, utilization and stability of food sources for all. The objective of this paper is to explore the trend of publications on food security and to identify selected topics of publications on food insecurity in Malaysia, Indonesia and Thailand within 2003 to 2022. The method of this study was used bibliometric analysis on scientific publications through Scopus databased. The findings indicated that publications volume of food security on Malaysia, Indonesia and Thailand have significantly increased within last ten years starting from 2013 to 2020. Based on subject area, the publications of food security on these three Asian countries focuses more on the subject of agriculture, environmental, social science, earth &amp; planet and the rest. The selected topics of publications of food insecurity on Malaysia was about health issue, household and elderly; Indonesia was about rural areas issue, rice production, urban areas issue, household issue, fisherman issue and coping strategies; Thailand was about household issue and rice production.</p>

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## 1. INTRODUCTION

Food security refers to the condition where all individuals have consistent physical, social, and economic access to safe, sufficient, and nutritious food that meets their dietary needs and preferences for an active and healthy life. It encompasses the availability, accessibility, utilization, and stability of food sources (FAO, 1996). The main challenges of food security are complex and multifaceted, often influenced by factors such as population growth, climate change, economic disparities and global food distribution systems. The most affected group in terms of food security are often vulnerable and marginalized populations, including rural communities, children, women, elderly, low-income urban, people with disabilities, indigenous and small scale of farmers. Food security in Asia is a complex issue due to the continent's diverse geography, population density, and economic disparities. While some regions have made significant progress in improving food security, challenges persist in many parts of Asia. Factors such as population growth, climate change, urbanization, and economic inequality contribute to these challenges (FAO, 2019). Research on food security is crucial because it helps us understand the complexities of the challenges involved and informs the development of effective strategies and policies to ensure a stable and equitable food supply for all. Research contributes to identifying the root causes of food insecurity, predicting trends, and evaluating the impact of interventions. It also aids in the development of sustainable agricultural practices, resilience to climate change, and the reduction of food waste. Moreover, research fosters innovation in food production, distribution, and nutrition, which are essential for addressing the ever-evolving nature of food security challenges (FAO, 2021). Therefore, this paper aims to explore the trend of research that has been done through publications in this region on selected countries which were Malaysia, Indonesia and Thailand. This study is attempt to fulfill two main objectives which were (1) to explore the trend of publications on food security in three countries and (2) to identify selected topics of publications on food insecurity in three countries within 2003 to 2022. This paper has the originality whereby the topic about food security viewed through publications with combination of publication on three countries, which were Malaysia, Indonesia and Thailand.

## DATA SOURCE AND RESEARCH METHOD

### 2.1 Data Source

Scopus is the largest and most comprehensive collection of information resources in the world with high impact academic journals in various fields. This paper used Scopus database as the data source, the search method was the search documents field within Article Title, Abstract and Keywords. The search formula is TITLE-ABS-KEY ((“food security”) AND (“Malaysia”)), ((“food security”) AND (“Indonesia”)) and ((“food security”) AND (“Thailand”)) with respectively and repetitively. After screening process, 1,578 documents in the field of food security that published within 2003 to 2022 were obtained in various types of documents.

### 2.2 Research Methods

#### 2.2.1 Methods of Bibliometric Analysis

Bibliometric has been used in many disciplines and become an important analysis method in scientific research. The retrieved literature information explores and analyzed using the software VOS viewer for data interpretations. This paper focus on observed and interpreted the overall literature data in the field of food security based on five point which is trend of publication volume, subject area analysis, citation analysis, sources analysis and keywords analysis.

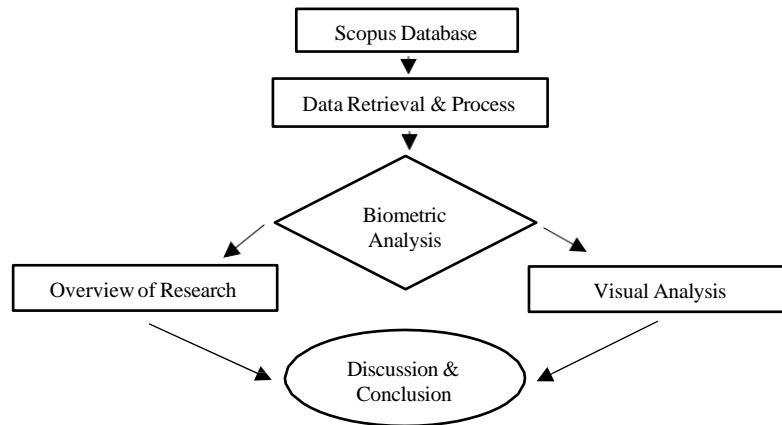
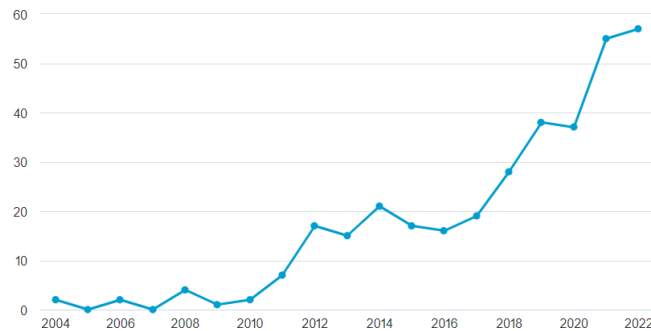


Figure 1. The workflow of bibliometric analysis process

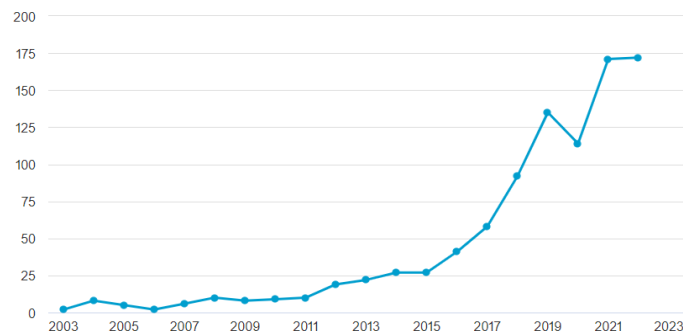
## ANALYSIS AND RESULTS

### 3.1 Trend of Publication Volume

#### 3.1.1 Malaysia



#### 3.1.2 Indonesia



#### 3.1.3 Thailand

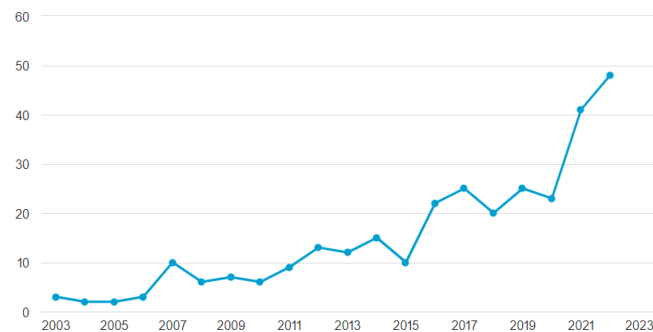


Figure 2. The graph of publications volume Malaysia, Indonesia and Thailand

Year	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21	'22	Total
Malaysia	0	2	0	2	0	4	1	2	7	17	15	21	17	16	19	28	38	37	55	57	338
Indonesia	2	8	5	2	6	10	8	9	10	19	22	27	27	41	58	92	135	114	171	172	938
Thailand	3	2	2	3	10	6	7	6	9	13	12	15	10	22	25	20	25	23	41	48	302

Table 1. Publications volume based on year and country

The graph of publication volume showed that Malaysia published 338 documents, Indonesia published 938 and Thailand published 302 with total 1,578 publications. There were two periods of time which is 2003 to 2012 with low publication and 2013 to 2022 with obvious increment of publication. Even though, in year 2020 the publication slightly drops for three countries, but still continue hike in year 2021. This situation happens probably related to pandemic Covid-19 such as lock down that slow down all activities in many sectors including research activities.

### 3.2 Subject Area Analysis

#### 3.2.1 Subject area with percentage of Malaysia publications

Subject Area	Percentage
Agriculture	17.9%
Environmental	17.3%
Social Science	9.9%
Economics	6.3%
Medicine	6.3%
Engineering	6.2%
Business Management	4.8%
Earth and Planet	4.7%
Biochemistry	4.1%
Computer Science	4.1%
Others	18.4%
Total	100%

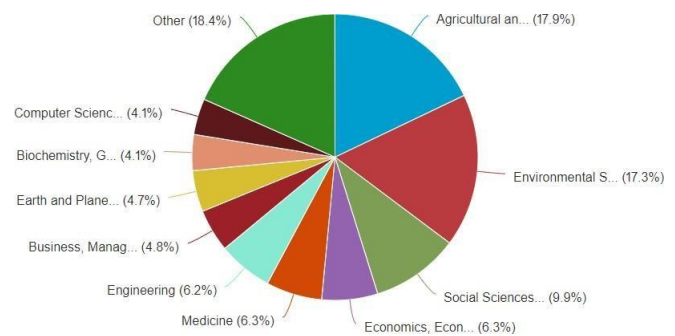


Figure 3. Pie chart of Malaysia

#### 3.2.2 Subject area with percentage of Indonesia publications

Subject Area	Percentage
Environmental	22.5%
Agriculture	15.0%
Earth and Planet	13.9%
Social Science	11.7%
Engineering	5.8%
Computer Science	4.4%
Economics	4.0%
Energy	3.5%
Business, Management	2.9%
Biochemistry	2.8%
Others	13.5%
Total	100%

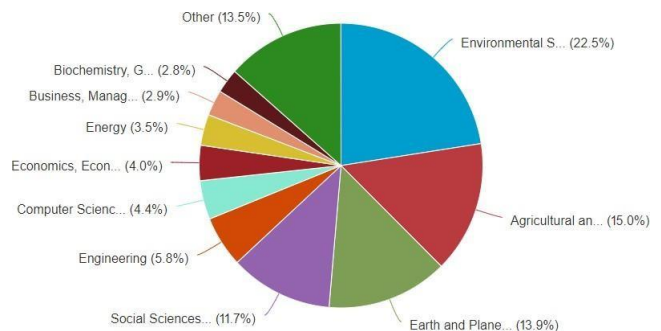


Figure 4. Pie chart of Indonesia

### 3.2.3 Subject area with percentage of Thailand publications

Subject Area	Percentage
Agricultural	23.8%
Environmental	17.7%
Social Science	15.8%
Engineering	4.8%
Medicine	4.7%
Computer Science	4.5%
Energy	4.5%
Earth and Planet	3.2%
Economics	3.0%
Biochemistry	2.9%
Others	15.1%
Total	100%

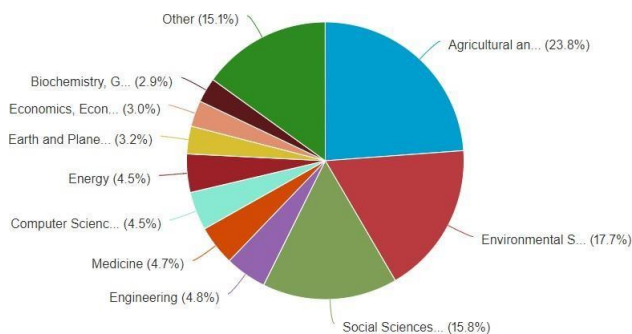


Figure 5. Pie chart of Thailand

The subject area analysis showed that top three Malaysia publications were agriculture (17.9%), environmental (17.3%) and social science (9.9%); top three Indonesia publications were environmental (22.5%), agriculture (15.0%) and earth & planet (13.9%); top three Thailand publications were agricultural (23.8%), environmental (17.7%) and social science (15.8%). This can be concluded that the high percentage of research area were potentially have wide range of research needed that gave significant impact on the issue of food security. The list of top three publications for three countries were agriculture, environmental, social science and earth & planet.

### 3.3 Citation Analysis

#### 3.3.1 The citation analysis of Malaysia

Title	Year	Cited
<i>Adoption of green fertilizer technology among paddy farmers: A possible solution for Malaysian food security.</i>	2017	59
<i>Paddy, rice and food security in Malaysia: A review of climate change impacts.</i>	2020	52
<i>Impact of climate change on food security in Malaysia: economic and policy adjustments for rice industry.</i>	2016	40
<i>Modelling of food security in Malaysia.</i>	2014	32
<i>Issues and challenges facing rice production and food security in the granary areas in the East Coast Economic Region (ECER), Malaysia.</i>	2014	29
<i>Impacts of climate change on food security and agriculture sector in Malaysia.</i>	2018	24
<i>Agricultural land use in Malaysia: An historical overview and implications for food security.</i>	2013	19
<i>Malaysia's strategic food security approach.</i>	2010	18
<i>Food security and low-income households in the Malaysian east coast economic region: An empirical analysis.</i>	2016	17
<i>Climate change, agriculture and food security issues: Malaysian perspective.</i>	2013	15

The citation analysis for Malaysia showed that the most cited article was related to intervention of technology on paddy or rice production, the climate change, agriculture activities and government economic & policy in food security issues in Malaysia.

### 3.3.2 The citation analysis of Indonesia

<i>Title</i>	<i>Year</i>	<i>Cited</i>
<i>COVID-19, agriculture, and food security in Indonesia.</i>	2020	48
<i>Using group model building to develop a causal loop mapping of the water-energy-food security nexus in Karawang Regency, Indonesia.</i>	2019	47
<i>Using climate models to improve Indonesian food security.</i>	2004	39
<i>Agroforestry contributions to smallholder farmer food security in Indonesia.</i>	2021	34
<i>Home garden commercialization: extent, household characteristics, and effect on food security and food sovereignty in Rural Indonesia.</i>	2020	34
<i>The state and food security discourses of Indonesia: feeding the bangsa.</i>	2017	31
<i>Household food security status measured by the US-Household Food Security/Hunger Survey Module (US-FSSM) is in line with coping strategy indicators found in urban and rural Indonesia.</i>	2007	22
<i>Reducing CO2 emissions and supporting food security in Central Kalimantan, Indonesia, with improved peatland management.</i>	2018	21
<i>Food security status of households in a cassava-growing village in southeast Sulawesi, Indonesia.</i>	2019	19
<i>The impact of climate change on the household food security of upland rice farmers in sidomulyo, lampung province, Indonesia.</i>	2020	18

The citation analysis for Indonesia showed that the most cited article was agriculture activities, forestry, water & energy, environmental and rural folks intervention in the context of food security issue in Indonesia.

### 3.3.3 The citation analysis of Thailand

<i>Title</i>	<i>Year</i>	<i>Cited</i>
<i>Bat pest control contributes to food security in Thailand.</i>	2014	89
<i>Small-scale production of edible insects for enhanced food security and rural livelihoods: Experience from Thailand and Lao People's Democratic Republic.</i>	2015	55
<i>Traditional ecological knowledge in Thailand: Mechanisms and contributions to food security.</i>	2016	20
<i>Understanding food security behaviors during the covid-19 pandemic in Thailand: A review.</i>	2021	15
<i>Impacts of the covid-19 pandemic on ginger production: Supply chains, labor, and food security in northeast Thailand.</i>	2021	13
<i>How does organic agriculture contribute to food security of small land holders?: A case study in the North of Thailand.</i>	2018	6
<i>Zero waste management to increase efficiency in palm oil production and processing for food security in Thailand.</i>	2017	6
<i>Red Jungle fowl Resource Management Guide: Bio resource Reintroduction for Sustainable Food Security in Thailand.</i>	2022	3
<i>Matriarchy, Buddhism, and food security in Sanephong, Thailand.</i>	2017	3
<i>The impact of climate change on food security and agricultural production in the Pak Phanang River Basin, Thailand.</i>	2017	3

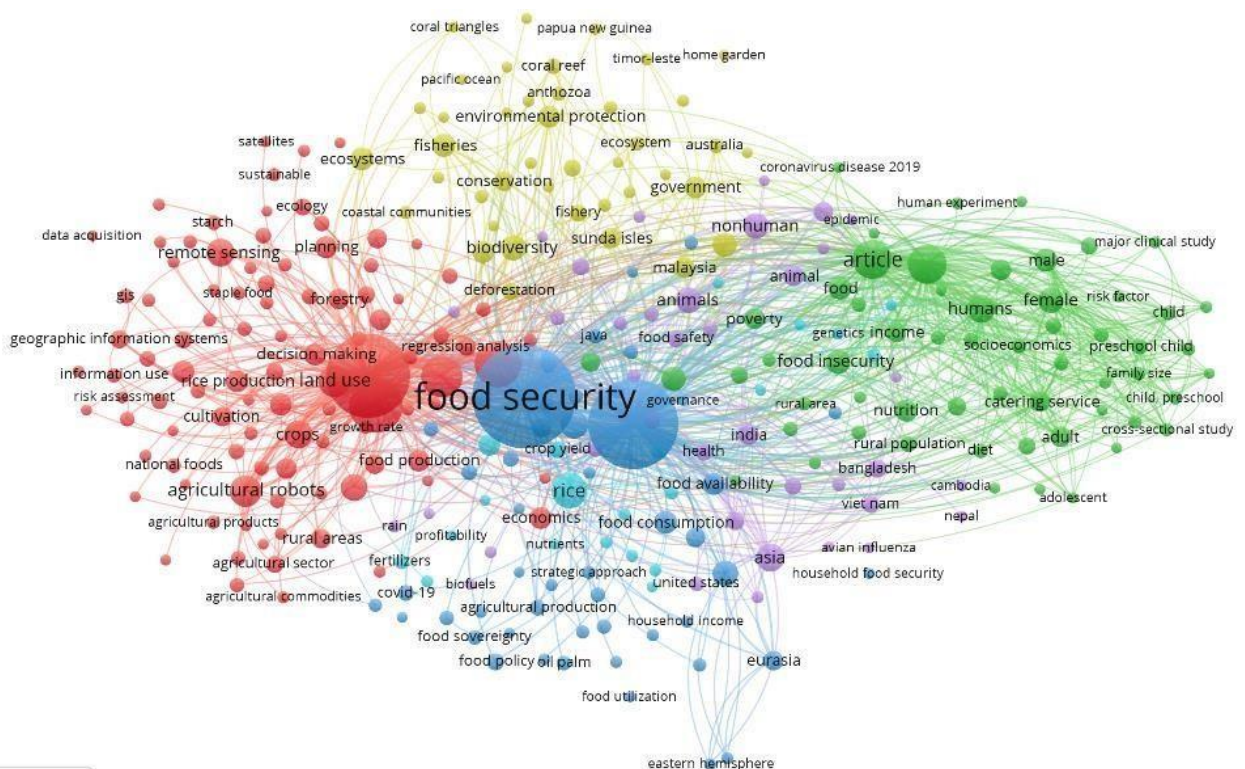
The citation analysis for Thailand showed that the most cited article was the intervention in agriculture activities, organic agriculture, forestry, waste management, climate change and the impact of Covid-19 on the issue of food security in Thailand.

### 3.4 Source of journal publicized food security documents

Source Title	Malaysia	Indonesia	Thailand
<i>AACL Bioflux</i>		8	
<b><i>Acta Horticulturae</i></b>	3	8	<b>11</b>
<i>Agricultural Systems</i>			4
<i>Agriculture Switzerland</i>			3
<i>Agronomy</i>			3
<b><i>AIP Conference Proceedings</i></b>	4	<b>20</b>	
<i>Biodiversitas</i>		13	
<i>BMC Public Health</i>	4		
<i>E3S Web of Conferences</i>		13	
<b><i>Food Security</i></b>			<b>5</b>
<i>Health Care for Women International</i>			3
<i>International Journal of Agricultural Technology</i>			4
<b><i>International Journal of Environmental Research and Public Health</i></b>	7		
<b><i>IOP Conference Series: Earth and Environmental Science</i></b>	<b>17</b>	<b>213</b>	
<i>Journal of Health Research</i>			3
<i>Journal of Physics Conference Series</i>		11	
<b><i>Journal of Sustainability Science and Management</i></b>	8		
<i>Kasetsart Journal of Social Sciences</i>			4
<i>Malaysian Applied Biology</i>	4		
<i>Malaysian Journal of Nutrition</i>	4		
<i>Marine Policy</i>		9	
<i>Nutrients</i>	4		
<b><i>Sustainability Switzerland</i></b>	5	<b>20</b>	<b>9</b>

The sources analysis showed that top three journal publicized for Malaysia articles in the field of food security were *IOP Conference Series: Earth and Environmental Science*, *Journal of Sustainability Science and Management* and *International Journal of Environmental Research and Public Health*; top three journal publicized for Indonesia articles in the field of food security were *IOP Conference Series: Earth and Environmental Science*, *AIP Conference Proceedings* and *Sustainability Switzerland*; top three journal publicized for Thailand articles in the field of food security were *Acta Horticulturae*, *Sustainability Switzerland* and *Food Security*. All journal publicized articles in the field of food security were internationally standard and worldwide accessible for the sake of food security research and development benefits. The common and shared top three journals publicized for three countries were *IOP Conference Series: Earth and Environmental Science* and *Sustainability Switzerland*.









#### 4.1.2 Household issue

A majority of the household (80.7%) displayed food insecurity (Nor Syaza Sofiah & Norhasmah, 2020). The prevalence of household food insecurity in Malaysia was high (Norhasmah et al., 2021), about (43.2%) of household (Seok Tyug Tan et al., 2022) and continues to exist with affected groups of low-income household and welfare recipient households (Norhasmah et al., 2021). The majority of indigenous households faced food insecurity (Siti Farhana et al., 2018; Norhasmah et al., 2021). Ethnicity, marital status, employment status, monthly earned income and being the head of a household were significantly associated with food insecurity during the MCO 1.0. (Seok Tyug Tan et al., 2022). A higher odds ratio for food insecurity were observed among Malaysian Indian those with active employment during the MCO 1.0 and those with a monthly income of less than RM4000 (Seok Tyug Tan et al., 2022). Demographic risk factors and socioeconomic characteristics included larger household, living in poverty and low education (Norhasmah et al., 2021). Nevertheless, households adopted several coping mechanisms as well as utilizing external assistance programs to reduce the impact of food insecurity and varied among households depending on resources available (Ku Nurasyiqin et al., 2021). The socioeconomic factors were pertinent in contributing towards food insecurity among the households in form of household income, insufficient assistance program and high living costs (Bakri Mat & Ku Nurasyiqin, 2019).

#### 4.1.3 Elderly issue

About (19.5%) elderly was found as food insecure (Wan Azdie Mohd et al., 2019) with affected groups of elderly (Norhasmah et al., 2021) and multifactorial (Susanti Alie et al., 2019). About (48.8%) of the adolescents were from households with food insecurity (Susanti Alie et al., 2019). The Health-related quality of life (HRQOL) and Body mass index (BMI) were lower in adolescents from food insecure households (Susanti Alie et al., 2019). The overall prevalence of food insecurity among older persons was (10.4%), older persons from rural areas with no or only primary and secondary education (Wan Azdie Mohd et al., 2019; Ruhaya et al., 2020), income less than RM 2000 (USD 477.57), depression, Instrumental Activities of Daily Living (IADL) dependency, low Quality of Life (QoL), underweight, inadequate plain water intake (Mohamad Hasnan et al., 2021), not receiving very high social support (Ruhaya et al., 2020) were at risk of malnutrition in Malaysia (Wan Azdie Mohd et al., 2019; Ruhaya et al., 2020). A nutrition assistance programme is suggested to improve the socioeconomic and food security status of older persons (Wan Azdie Mohd et al., 2019; Susanti Alie et al., 2019).

### 4.2 Indonesia

#### 4.2.1 Rural areas issue

The characteristics of food insecurity in rural areas consist of fuel used for cooking, education of the head of the household, type of wall in the residence, type of floor and ownership of land on which they build a house (Evi Ramadhani et al., 2022). Other than that, the frequency of natural disasters in village level are significant and have a negative effect on food insecurity status (Fachrudinawati & Dwini Handayani, 2019).

#### 4.2.2 Rice production

The increase in rice production has not been successfully eliminating the problem of food insecurity in West Nusa Tenggara (R H Sayuti et al., 2022). In addition, the shrinking land size to only 0.59 hectares per household due to the use of land for purposes other than agriculture adds to the impact of food insecurity (Jajat Sudrajat & Adi Suyatno, 2021).

#### 4.2.3 Urban areas issue

The predictors of urban food insecurity were income, employment status, dependency ratio, a respondent's urbanization status and home ownership status (Vicka Kharisma & Naoya Abe, 2020). The characteristics of food insecure households in urban areas consist of the type of fuel used for cooking, floor area of the house, proper sanitation, drinking water sources and education of the head of the household (Evi Ramadhani et al., 2022). Growing food in the city offers some protection against food insecurity through improved quantity, quality and diversity of food options (Jessica Ann Diehl et al., 2019).

#### 4.2.4 Household issue

About (33.4%) to (46%) of households were experiencing food insecurity (Annis Catur Adi, et al., 2020; Trias et al., 2022), where (68.9%) were in the low of calories consumption (Eka Rastiyanto et al., 2019). These

household characterize by many members, low education level of household head, divorced household head, household head is a smoker, household head engages in agriculture or construction work and residence is in rural or backward regions (Eka Rastiyanto et al., 2019). Thus, households with moderate and low welfare need special attention from the government because they have food insecurity with relatively good perception and high participation (Mersyah et al., 2021). This situation forced households changed their diets, borrowed food or money from relatives and relied on traditional coping mechanisms such as food sharing (Nurbaya et al., 2019). In other way, households can provide vegetables and fruits that were highly available and accessible such as water spinach, banana and orange (Rian Diana et al., 2020) in overcoming food insecurity that they experienced.

#### 4.2.5 Fisherman issue

About (22%) of fishermen's households in Teluk Betung Selatan District is mostly in the food insecurity category (C Yolandika et al., 2021). In addition, the level of energy adequacy of fishermen's households in Teluk Betung Selatan District is (52%) in the poor category (C Yolandika et al., 2021).

#### 4.2.6 Coping strategies

The cause of food insecurity is not only determined by the degree of food supply itself but it may also be caused by the lack of a good governance implementation, food distribution and the effort in empowering the farmers (Syahrir & Islamiyati, 2020). For instance, the cash transfers could be an effective means of reducing food insecurity problems among small-island communities in Indonesia (Rus'an et al., 2020) but complete elimination of these issue through cash transfers alone is impractical (Rus'an et al., 2020). An effective cross-sectoral policy intervention monitoring is needed to cope with the food insecurity issue both in regional and national levels of the country (Vicka & Naoya, 2020). The improvement of food security in order to overcome food insecurity in districts in East Nusa Tenggara should be done by promoting local wisdom especially by the development of agricultural cultivation based on customs and local potency (Riptanti, E. W et al., 2018). For instance, the Kaluppini households be encouraged to grow essential foods in their gardens to enhance food security (Nurbaya et al., 2019).

### 4.3 Thailand

#### 4.3.1 Household issue

The poorest households were likely to suffer from food insecurity (Jintana et al., 2022). The factors that contribute to food insecurity in Southeast Asia (SEA) influenced by communities and the diversity of responses (Amy Freedman, 2017), as well as cultural values impact eating and lifestyle behaviors (Lisa Franzen & Chery Smith, 2009). Households with children under 5 years old living in rural areas had lower food insecurity severity scores (Jintana et al., 2022). The landownership, possession of a Thai card (Government registration card), increased food prices and a dependence on imported food from other districts were important factors associated with household food insecurity in the sub-district (May Myat Cho et al., 2012). The food insecurity as a problem among Thai households and intensify programs and research on nutrition security to address this problem by stakeholders (May Myat Cho et al., 2012).

#### 4.3.2 Rice production

The prospects might be for greater cooperation in coordinating rice and other crops more generally policies so as to better ensure reliable access for more citizens in the region (Amy Freedman, 2017). Thailand, Vietnam, and Cambodia are all major exporters of rice, whereas Indonesia, Malaysia, Singapore and the Philippines are all importers of rice (Amy Freedman, 2017). The voter-politician linkages resulted in different rice policies in the between countries (Arnold H. Fang, 2018). Furthermore, the instability in the world rice market showed that strategies with greater sustainability considerations are needed in addressing domestic income disparities and global food insecurity (Arnold H. Fang, 2018). For instance, the local farmers in Thailand and Cambodia face the conditions of food insecurity by forces of food supply chains (Siya Uthai, 2020).

## 5. CONCLUSIONS

The graph of publications volume showed that Malaysia, Indonesia and Thailand have significantly increased the publications within last ten years starting from 2013 to 2020. This trend was positive and showed that food security issue becoming important and have impact on many sectors towards Malaysia, Indonesia and Thailand. Most of the type of publications within twenty years were in the form of article, which is Malaysia

(66%), Indonesia (52.9%) and Thailand (73.8%). The research activities contribute to scientifically problem solving regarding food security for the benefits all mankind. The subject area analysis showed that Malaysia, Indonesia and Thailand focuses more on the subject of agriculture, environmental, social science, earth & planet and the rest. The main subject area that related to food security publications within twenty years were agriculture, which is Malaysia (17.9%), Indonesia (15.0%) and Thailand (23.8%). The second subject were environmental, which is Malaysia (17.3%), Indonesia (22.5%) and Thailand (17.7%). The issue of food security closely related to human being, therefore the subject of social science was focused, which is Malaysia (9.9%), Indonesia (11.7%) and Thailand (15.8%). This can be concluded that the issue of food security is the global issue, thus Malaysia, Indonesia and Thailand moving forwards to overcome this challenge through researches, innovations and cooperation in all sectors related to food security.

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