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Strategic Analysis of Climate Change and Food Security In Malaysia

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Abstract

Climate change is a natural process that occurs when there are changes in the weather temperature, amount of rainfall, and wind. According to the United Nations (2021), climate change happens when there is a high amount of greenhouse gas emissions. Human activities such as power generation through the burning of fossil fuels, manufacturing, deforestation for development projects, transportation, food production, and others contribute to the increase of greenhouse gases globally. This article focused mostly on the Malaysian Ministry of Agriculture and Food Industry (MAFI) to address climate change and food security. This article adopted several key strategic management techniques such as PEST analysis, a custom-made internal audit analysis, *and SWOT analysis technique for the purpose of performing the internal and external analysis of Malaysia climate change and food security. This serves as a tool for identifying issues relating to food security. The TOWS matrix and BOS were then utilised to generate many viable recommendations. This article is useful in giving information on food security in Malaysia as well as appropriate recommendations that relevant stakeholders may implement.*

Keywords*: Climate Change, Food Security, Agriculture Policy, Strategic Analysis*

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INTRODUCTION

Climate change is a natural process that occurs when there are changes in the weather temperature, amount of rainfall, and wind. Over the centuries, the temperature of the earth has increased due to human activities. According to the United Nations (2021), climate change happens when there is a high amount of greenhouse gas emissions that consist of Carbon Dioxide, Methane, Nitrous Oxide, Fluorinated gases, and others. These types of gas can be generated into Oxygen through the process of photosynthesis. However, the inability of the green plants to produce enough Oxygen to recover the greenhouse gases might happen due to the low number of green forests. The decrease in the number of green forests is due to the uncontrolled amount of deforestation activities. Human activities such as power generating through the burning of fossil fuels, manufacturing, deforestation for development projects, transportation, food production, and others contribute to the increase of greenhouse gases globally. For example, in agriculture activities, some of the food crops such as paddy and cattle produce Methane gas through the waste. When there is an uncontrolled amount of greenhouse gases that was released, it will increase the global temperature. The rise of the global temperature

will cause the melting of polar ice, thus increasing the changes of the sea level and affecting the supply chain (Vaghefi, Shamsudin, Radam, & Rahim, 2015). In the study that was conducted by Rosenzweig & Liverman (1992), and Huang, Lampe, & Tongeren (2011), it is shown that the unstable climate change affects the output of the agricultural products of the countries that are located at low latitudes in geographical location. The area located in the low latitude region consists of tropical and semitropical nature, such as Malaysia, Thailand, Indonesia, and others.

It is the responsibility of the Ministry of Agriculture and Food Industry (abbreviated MAFI) to steer the transformation processes occurring in the agricultural sector in a manner that is planned, integrated, and comprehensive. This is accomplished through the mobilization of all thoughts and organizational energy towards the accomplishment of the Agri-Food Policy Goals. The MAFI oversees agriculture, agro-based industries, agrotourism, livestock, veterinary services, fisheries, quarantine, inspection, agricultural research, agricultural development, agricultural marketing, the pineapple industry, agribusiness, and the botanical garden. There are various agencies under MAFI that are fully responsible for various aspects and fields of agriculture and the food industry. They have four federal departments, such as the Department of Agriculture (DoA), Department of Veterinary Services (DVS), Department of Fisheries Malaysia (DoF), and Malaysian Quarantine and Inspection Services Department (MAQIS).

Methodology

This paper utilizes several important strategic management methods. This article focused mostly on the Malaysian Ministry of Agriculture and Food Industry (MAFI) to address climate change and food security issues. Firstly, external, and internal analysis were conducted on MAFI to comprehensively study climate change and food security in Malaysia. A PEST analysis technique is used to analyze opportunities and threats to MAFI that are beyond its control. PEST analysis consists of four factors, such as the political environment, economic environment, social-cultural environment, and technological environment. Meanwhile, a custom-made internal audit analysis is used to analyze the strength and weaknesses of MAFI, which means that factor can be controlled by MAFI. All analysis is done after examining all secondary sources such as articles, news, reports, and the National Agrofood Policy 2.0 (NAP 2.0). In addition, the analysis was also done by conducting semi-structured interviews with the MAFI staff.

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Following this, all analyses were examined through the lens of a SWOT matrix to present distinct points of argument. After that, alternative suggestions have been developed based on the TOWS Matrix. In this process, both the internal and external environments of MAFI have been evaluated to give recommendations for the highlighted challenges.

Challenges Faced in Food Security in Malaysia

This article has identified and discussed several key challenges that Malaysia's agriculture and food industries are currently facing by utilizing three different analysis techniques namely (i) the external factor analysis using PEST technique), (ii) the internal factor analysis technique using Custom-made Internal Audit Analysis), and (iii) the SWOT matrix technique. The term PEST refers to the following acronym: political and legal; economic; socio-cultural; and technological. This method was applied in order to determine the external elements that might either be a barrier to obtaining food security or could lead to the development of new opportunities in this field. An internal factor analysis was used to determine the strengths and weaknesses of an organization particularly the Ministry of Food Industries and its agencies, nonetheless, the results were not conclusive. The SWOT analysis as depicted in Figure 1, is an acronym that stands for Strength, Weakness, Opportunities, and Threats. It is a useful method that was used to assist in the categorization of factors that were derived from PEST and internal analysis. This analysis provides clear information prior to the development of feasible alternative strategies.

1. Lack of cooperation between ministry and others

In any cooperation for a certain project, it does indeed need a good collaboration between the Ministry of Agriculture and Food Industry (MAFI) with other ministries or agencies. Thus, a good corporation is vital because by having good cooperation, any project can be developed as well as implemented which will achieve the objectives of the project. However, it will become useless or delayed if there is a lack of cooperation between MAFI and others because with this cooperation, it will increase the involvement and at the same time it also will help the huge burden on MAFI alone. Due to this, there are several challenges that MAFI had to face.

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One of them is unable to work well between MAFI and the state-level government due to inconsistent plans. There are 11 divisions under MAFI and 13 agencies that are directly under MAFI that are active in the agro-food industry. In the past, based on NAP 2.0, there were functions that various agencies played that overlapped with one another, particularly in the areas of training and development, regulation and licensing, subsidies, and grants, as well as research and development (R & D). Because of this, the agriculture and food industries, which must negotiate with a variety of agencies in order to receive permission or assistance, are susceptible to experiencing confusion. This is because there is a lack of efficient communication between agencies that work in silos, as well as duplication of inter-agency duties under MAFI. This, in turn, results in an inability to minimize costs in the implementation of projects.

Another challenge is due to lack of cooperation**.** Based on the NAP 2.0, the reason for MAFI being hardly able to improve in agriculture sectors is due to lack of corporations. In any programs, the corporations with other organizations are important which cannot be denied. However, it will become unsuccess when some of these organizations did not give their full attention towards the programs thus the outcome is not met to satisfaction. The findings that can be found from the interviews of one of the employees of MAFI, they are unable to implement the program in the best conditions due to lack of cooperation between MAFI and others. Not to mention, some of them prefer to work with silos, thus causing inefficient resources as well as implementations.

Other than that, the inconsistency of the policies affects the implementations is one of the challenges when the MAFI want to face with the food security in Malaysia. The policies will keep changing to be up to date with the current situations. Not to mention each issue will need different policies to solve the problems. Not only that, it also helps to stabilize the country to ensure that it will not cause an undesirable impact and conflicts. Policy could also affect how well agriculture takes care of the environment by encouraging or discouraging the delivery of environmental services. Agricultural policy encourages people to take advantage of more incentives, and how people take advantage of these incentives has different effects on the natural environment. This variety is caused in part by the physical qualities, such as topography, that are unique to a place and in part by the decisions that different people have made over time as well as the size of the effect may affect how big it is (DeBoe, 2020). Malaysia has faced the problem of inconsistency of policies and based on interviews

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conducted to one of the MAFI's employees, due to the inconsistency of policies, they face problems with the implementation. It is because each policy takes time to make and as well as to put into implementation. Not to mention, there are still some employees who did not get enough information thus they face problems on how to implement the new policies. Due to this, it can be said how important it is to have consistency of the policies implementation.

Lack of foreign investors and private sectors in agriculture is also one of the challenges faced by MAFI due to lack of corporations. Malaysia's government has recognized the significance of foreign direct investment (FDI) to the country 's economic growth. Over the past decade, employment opportunities and industries have been created thanks to the progressive liberalization of the economy and the influx of FDI. They have aided Malaysia's export-driven strategic plan. Trade is vital to Malaysia's economic growth (U.S. Department of State, 2021). Not only that, it also will give opportunities to the private sectors to make collaborations with the government and at the same time it also will increase their interest in agriculture sectors. However, according to NAP 2.0, due to the low of foreign investors, MAFI is facing problems in increasing the number of trade activities in the agriculture and food industry. When there is a high number of foreign investors, it will strengthen the domestic market value chain, thus increasing the profit of the local farmers as well as private sectors.

2. Problems with organization's management

Redundancy of roles or functions between agencies under MAFI creates problems for the organization's management. There are 11 divisions under MAFI and 13 agencies that are directly under MAFI that are active in the agro-food industry. In the past, based on NAP 2.0, there were functions that various agencies played that overlapped with one other, particularly in the areas of training and development, regulation and licensing, subsidies, and grants, as well as research and development (R&D). Because of this, the MAFI stakeholders, who must negotiate with a variety of agencies to receive permission or assistance, are susceptible to experiencing confusion. This is because there is a lack of efficient communication between agencies that work in silos, as well as duplication of inter-agency duties under MAFI. This, in turn, results in an inability to minimize costs in the implementation of projects.

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This is because there is a decentralized database of information for industry and investors. NAP 2.0 stated that it was discovered that the procedures for collecting data are not as standardized, and databases are not as well integrated, so that they cannot serve as a reference for the agri-food industry and cannot cut down on the amount of effort required for data gathering. In addition, the data that is currently available for the industry could not be inclusive and thorough because it only includes information from companies that are registered with MAFI. Other than that, when it comes to providing information and services to investors, there is a lack of one-stop facilities. Investors and food producers alike must consult several different authorities in order to understand the complexities of the investment process. For example, information on land use, commerce, and other functions along the value chain may only be accessed by state authorities, trade-related authorities, and other relevant institutions.

As the organization that manage the agriculture affairs in Malaysia, the issue of lack of efficiency, quality in service, and product delivery to the stakeholders is one of the main challenges that was faced by MAFI. When MAFI failed to deliver the proper service to the stakeholders, it will cause loss and burden to the stakeholders, especially the small-scale farmers (Keong, 2022). There are several complaints that were made by the stakeholders, such as farmers towards MAFI. In the article by Omar (2022), farmers from Masjid Tanah, Malacca had lodged complaints that they did not receive assistance from MAFI on the scheduled time. After the flash flood hit Masjid Tanah in December 2021, some of the farmers have to face the loss of their crops and seeking for assistance from MAFI for the capital. However, the delay of the service delivery will affect the progress of the farmers, thus unable the farmers to produce the crops with sufficient amount.

Furthermore, since one of the high contributors of the greenhouse gas emissions is come from the agricultural activity, the unsustainable agriculture practice will cause the climate change in Malaysia. Some of the agricultural practices such as the usage of pesticides will contribute in environmental issues such as air and soil pollution (Rahman, 2021). The usage of pesticides is good in controlling the number of insects that can bring damage to crops. However, the uncontrolled amount of pesticides will cause damage not only to the environment but also to people that consume the crops. Other than that, the agriculture operation such as fish farming without good practices also will result in water pollution, thus disrupt the water supply to the population (Aziz, 2020).

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3. Limited resources

Resources are one of the most crucial elements that need to be owned by the organization. There are many types of resources, such as land, capital, entrepreneurship, and labor. In managing the issue of food security in Malaysia, one of the challenges that were faced by the MAFI is the insufficient number of employees under MAFI that are able to handle the task. According to MAFI, they are faced with insufficient employees that can help to handle the task, and due to this, each task that needs to be completed takes a longer time. MAFI also stated that some of the employees need to do more than two jobs simultaneously, which affects their work performance and delays their progress (Jani, 2022). For example, MAFI needs to send representatives for UNFCCC; thus, those in the ministries will be short of employees to handle the task.

Next, another challenge that was faced by MAFI was the shortage of manpower in the agriculture sector because of the high dependency on foreign labor. In the Malaysian agriculture sector, there is a high dependency on manual labor from foreign countries. The high dependency on foreign manpower will affect the output of the agricultural products when the issues related to foreign labor happen. For example, during the pandemic Covid-19, agriculture activities became slower since many foreign labors was sent back to their homeland (Ministry of Agriculture and Food Industry, 2021). In the article by Anderson (2021), it was reported that Malaysia has the highest number of foreign workers, which is 1.8 millions of documented workers and 1.46 millions of undocumented workers. The high dependency on the foreign workers will affect the number of crops productivity (Idris, 2022).

Not only that, nowadays there is a lack of interest from youth to be involved in agriculture sectors**.** According to the Dr Abdul Rahman Ismail, the assistant minister for Agriculture, Native Land, and Regional Development in Malaysia stated that the agriculture formerly known as the "sunset industry," whereby they need to work every day under the hot sun and at the same time it was suitable for those who make their homes in rural areas (Borneo Post Online, 2019). It was hard to make these youths involved in agriculture because they thought that the job was not suitable with the current situations, and it was not up to their standard compared with their educational qualifications. Agriculture was not a professional or pleasant field to work in, and it was not a simple career because it required farm management skills. They thought

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agriculture was unprofessional and unappealing (Farah Adila et al., 2012). In the article by Rahman (2020), among a million of registered farmers in Malaysia, only 15 percent are youth, equivalent to 240,000 people. According to MAFI, the low participation of youngsters in the agriculture sector is because this sector was considered as unprofitable. Even though the agriculture sector was developed in the usage of technology and machinery, Malaysian youth are still stuck with the mindset that agriculture is the sector that brings least profit.

Another challenge that was faced by MAFI in controlling the issue of food security is the insufficient amount of budget to implement new advanced technology. According to MAFI, the amount of budget that was allocated by the government for MAFI is enough, but for MAFI to use the high technology machineries, it requires a higher amount of additional budget (Jani, 2022). There are various initiatives that were taken by other countries to control greenhouse gas emissions. For example, some countries such as China choose to obtain electric power through solar energy. Even though these initiatives do contribute to reducing the number of greenhouse gases, the cost to build solar power generators requires a high amount of budget (Utusan Malaysia, 2021). Due to that, the government take the initiative to implement the process of building the solar power generators in stages.

4. Constraint to Productivity

In agriculture sectors, they are also faced with the problem of productivity. It is due to several challenges for certain projects or programs. It cannot be denied that the life of people is important, however, the MAFI face with the problems on how to be able to fulfil the needs and demand of people and at the same time to be able to face with the climate change. Not to mention, climate change and food security are interrelated with agriculture.

Firstly, one of the challenges that was faced by MAFI is some of the suppliers are not able to fulfil customers' demands of certain products. When climate change occurs, it will affect the amount of rainfall that is supposed to be received in a year. Since Malaysia is a country that has different amounts of wet and dry weather every year, it will affect the productivity of the crops. For example, since the Durian tree will be fruit in a certain season, the farmers are not able to supply the exact amount of Durian fruit to the customers consistently. Even when there is an excess of the fruit, the

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supplier must process the fruits to another product in order to prevent it from turning bad.

Secondly, one of the challenges is the dilemma to choose between food security or climate change issues**.** One of the greatest difficulties that we have as humans is ensuring to have sufficient food even though climate change is already having major and pervasive consequences on our ecosystems. While the effects of climate change may not be immediately apparent, prompt action is necessary to provide agricultural production systems with the time they need to become more robust (United Nations, 2015). The greenhouse gas emissions can happen through human activities, such as agriculture. Some agricultural products such as paddy and cattle release methane gas naturally. According to Searchinger & Waite (2014), 1.5 percent of the total greenhouse gas emissions are coming from methane that was produced through the rice. Since rice is the main food that was consumed by Malaysians, MAFI faced the dilemma of producing the rice with the amount of methane gas that was released and which needed to come first between the people or the climate change.

Thirdly, another challenge that must be faced by MAFI is controlling the problem of infectious diseases among the animals, livestock, and climate change in Malaysia. Recently, Malaysian farmers are facing the problem of Lumpy Skin Disease (LSD), which is an infectious disease that infects farm animals such as cattle and buffalo. This disease originally came from Thailand and spread to peninsular Malaysia. This disease becomes a threat to local farmers since MAFI still does not find the cure of the disease (Hibrahim, 2021). The issue of the infectious disease will cause other problems such as the increase of the food price.

Finally, the high number of small-scale agriculture producers which difficult to make mass production difficult is also one of the challenges that was face by MAFI. According to MAFI, there are two types of small-scale farmers in Malaysia. The first type of small-scale farmer is the farmer that produces a limited number of crops due to a small amount of land. The second type of small-scale farmers is the farmers that have wide lands but decided to divide the land to produce different types of crops (Jani, 2022). The farmers that able to produce the small-scale crops will receive a low amount of profit, and this causes the low income of the farmers.

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Figure 1: SWOT Analysis Technique

Strength	Weakness
1. Many experts in the research and development in agriculture and food industry. 2. MAFI staff have the skills in communicating with foreign officials and resolve issues. 3. MAFI encourages participation in the agriculture and food industry by providing capital and subsidies. 4. Consistency to encourage the innovation and development of technology in agriculture 5. Various departments to manage various fields 6. MAFI is able to provide necessary equipment and machinery for agriculture. 7. FAMA has the ability to help farmers to sell and promote their products	1. Redundancy of roles or functions between Agencies under MAFI 2. Decentralized database information for Industry and investors 3. Unable to work well between MAFI and state-level government due to inconsistent plans 4. Lack of cooperation between ministries due to different interests 5. Inconsistent policies affect implementation 6. Insufficient number of staff under MAFI that can handle the task. 7. Lack of efficiency, quality in service, and product delivery to the stakeholders due to many processes that need to be followed. 8. Insufficient budget to implement advanced technology 9. Dilemma to choose between food security or climate change issues- eg. paddy produces methane (CH4), one of the greenhouse gases.

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Opportunity	Threat
1. UN Framework Convention on Climate Change (CoP26) supports policies that focus on addressing the climate crisis 2. Lot of lands that can be used for agriculture 3. Advancing technology in livestock farming. 4. Due to the increase in the unemployment rate, those who are unemployed able to involve in the agriculture sector 5. Discount carbon tax for private sectors that use green technologies 6. Increasing hydroponic farming. 7. Increase the output of agriculture products through self-farming.	1. The suppliers cannot fulfil the customer's demand 2. Lack of foreign investors and private sectors in agriculture 3. The problem of infectious disease among animals/livestock and climate change. 4. Shortage of manpower in the agriculture sector because of high dependency on foreign labor. 5. Unsustainable agricultural practices that can cause climate change. 6. Small-scale agriculture producers which difficult to make mass production 7. Lack of interest from youth to involve in agriculture sectors

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Recommendation

This section put forward several recommendations that can be done to overcome the climate change and ensure food security. This recommendation derived from a TOWS matrix technique which helped produce a strategy that could be the best solution to face all the challenges. TOWS matrix technique consists of four quadrants namely Strength-Opportunities (SO), Weakness-Opportunities (WO), Strength-Threats (ST) and Weakness-Threats (WT). Each quadrant uses every element in the SWOT analysis to produce strategies such as (i) SO - utilizes internal strengths to maximize or optimally use external opportunities available to an organization, (ii) ST - maximizes the strengths of an organization and minimizes the threats using those strengths, (iii) WO - minimize weaknesses of an organization and maximize opportunities, (iv) WT - minimize threats and weaknesses. After that, the strategy selection for this paper is to use the Comparative Table of Strategies Attractiveness. This table was created using the Blue Ocean Strategy (BOS) which consists of three elements namely low cost, fast execution,

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and high impact. Therefore, it resulted in four thrust strategies that are recommendations in this paper that can be used as alternatives and strategies to overcome challenges.

Figure 2: TOWS analysis

SO strategies **S1 S3 S4 O3 O6:** Encourage smart agriculture and food industry through innovation and development in technology. **S1 O4:** Increase the job opportunities in agriculture and food industries sectors. **S2 O5:** Encourage the collaboration with private sectors to use green technologies. **S5 S6 O7:** Focusing to increase the output of agriculture and food industries product. **S3 O2 O6:** Increase the participation as well as the output in agriculture sectors. **S1 O1:** Have collaboration with other countries at UNFCCC on how to manage food securities as well as climate change.	**WO strategies** **W5 W8 O1 O3**: Implement awareness programs at the international level through the international forums with UN **W3 W8 O4 O6:** Encourage people that live in urban/semi-urban areas to participate in agriculture activities. **W3 O2 O7:** Implement a program for increasing the productivity of the stakeholders that use the private land. **W8 W9 O4 O6 O7:** Implement a program/ campaign that gives awareness about the importance and benefits of self-agriculture and the impact on climate change. **W4 O2:** Implement a program that can give benefits to various ministries. -eg. agro tourism **W5 O1 O5:** Strengthen the policy that can be implemented to reduce the greenhouse gas emissions- through the research that was provided in UN Framework **W2 W7 O2:** Improve data management to facilitate stakeholders. **W1 W6 01** Uniformity understanding about role and function
ST strategies **S3 T4 T7:** Use innovation in promoting to encourage the interest from youth. **S3 S5 S6 T1 T6 Focus** on strengthening the domestic market to guarantee food security. **S1 S5 T3 T5** Preparing the farmers and food producers to overcome the effect of climate change and disease. **S4 S5 T4 T7** Attract young people to get involved in agriculture sector and food industry. **S2 S7 T2** Encourage foreign investors into the domestic agriculture sector and food industry.	**WT strategies** **W3 W4 W6 T4 T6 T7:** Encourage cooperation in agriculture project with other ministries and local government. **W2 T1 T6:** Centralize the data information from all agencies under MAFI to help to fulfil the demand of customers. **W1 W7 T7:** Restructuring the function all agencies' roles under MAFI. **W6 T4 T7:** Implement a program/campaign that gives awareness about the benefits and importance of agriculture. **W5 W9 T5:** Make a new policy and implement to control the production of agriculture to ensure farmers would not over produce. **W8 T2 T3:** Promoting for advance technology to industries.

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1. Encourage smart agriculture and food industry through innovation and development in technology

For the Strength and Opportunity (SO) quadrant, there are three strategy that fulfil the elements of Blue Ocean Strategy, which is low cost, fast execution, and high impact. The first strategy that fulfil the BOS elements is S1S3S4 O3O6, which is to encourage smart agriculture and food industry through innovation and development in technology. The second strategy that fulfil the BOS elements is S5S6 O7, which is focusing to increase the output of agriculture and food industries products. While the third strategy that fulfil the BOS elements is S3 O2O6, which is increase the participants as well as the output in agriculture sectors. Among the three strategies that meeting the BOS elements, the strategists decided to focus on the first strategy, S1S3S4 O3O6, since the strategy may give the high impact in the long-term period.

The first program that was proposed under the Strategic Thrust to encourage smart agriculture and food industry through innovation and development in technology is Gather Farms. Gather Farms is the program where MAFI collaborate with the farmers that own private lands. With the consent of the farmers, MAFI will provide the guidance and fund assistance to the farmers. Since different location of lands consist different types of soil, MAFI will decide on what kind of agriculture activities that are suitable in that area. Before implement the program, MAFI will identify the budget that was allocated and prepare the documentation of the processes. Through this activity, the farmers will have a clear understanding on the aim and procedure of the program. After that, MAFI identify the participation of the farmers. Several requirements need to be fulfilled by the participants before they are accepted for the Gather Farms program such as the registration certificate, detail information of the land location, and others. Then, MAFI will structure the number of manpower and machineries that will be involve in this program. For this program, there are two key performance indicator (KPI) that need to be achieve by the end of the program. The first KPI is 2,000 number of farmers that participate in this program, and the second KPI is the number of total profits that need to be achieve by the farmers during the program implementation. The agency in charge for this program is MAFI and Farmers Organization Authority Malaysia (LPP). The estimated budget for this program is RM13 million.

The second program under the first Strategic Thrust is increasing the closed house poultry farm. This program is focused on the bird breeders, since birds such as

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chicken and duck are the most consumed livestock among Malaysian. The difference between the closed house poultry farm and open farm is closed house poultry farm will protect the birds from the disease that will be carried by the outside insects such as mosquito, flies, and others (Zakaria, 2020). The birds that were raised in the closed house poultry farm are much secure and more hygiene. Before the implementation of the program, the documentation of the budget allocation will be prepared. Next, MAFI will identify the number of bird breeders in each state that still using the open farm. Then, MAFI will make agreement with the farmers to provide monetary assistance for the bird breeders to build the closed poultry farm. The KPI that need to be achieved by the end of the program is 15 closed house poultry with the size 62 x 12 meters was build and started operated. The agency that will be in charge for this program is MAFI, Veterinary Service Department, and local government. The estimated budget for this program is RM3 million annually, since the estimated cost to build one closed poultry farm is around RM750,000.

The third program under the first strategic thrust is focusing on promote and encourage the farmers to use the developed seed's gene that was improved and developed by MAFI. Some of the farmers does not aware that MAFI developed the new types of seeds that can increase the output of fruit production with the high quality. Thus, this program is mostly will give awareness to the farmers through advertisements. Before making the advertisements, it is crucial for MAFI to identify the types of developed seeds and the detailed information about the seed usage procedures. In this program, the advertisement will be done through media mass such as television, and social media. When the farmers are aware about the seeds, it will encourage the farmers to shift their agriculture production to the advanced seeds. The KPI of this program is the total of 177,718 vegetables and fruits farmers in Malaysia.

The fourth program, which was called as SubSeeds are related with the third program, since it has the same aim, which is to encourage the farmers to use the developed seed's gene. When the farmers in Malaysia are aware about the benefits of the developed seeds, it will encourage them to use the developed seeds. Through this program, the farmers able to use the developed seeds that was provided by MAFI. The KPI for this program is 88,859 of the farmers in Malaysia. The target of the farmers that will participate in SubSeeds are lower compared to the previous program, since not all farmers will be interested in using the developed seeds. The estimated budget for this program is RM45 million, which is very high compared to the others program. The

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budget estimated is high because this program involves the research and development process.

Finally, Smart Green is the program that was aimed to develop the drainage system of the local farms, so the farms will have more efficient and sufficient water access. Due to the unstable climate change, the issue such as drought might occur. The drought will affect the number of output and the quality of the crops. Other than that, there are also issue of the wastage of water when the farmers did not have the effective drainage system. In this program, the government will provide the assistance that was required for building the proper drainage system for the crops. Before the program implementation, MAFI must prepare the documents of legal processes since the progress will involve the local government.

2. Preparing the farmers and food producers to overcome the effect of climate change and disease

Preparing the farmers and food producers to overcome the effect of climate change and disease is the third strategy in the ST quadrant. This third strategy has been chosen after fulfilling all BOS elements where it is a strategy that does not use high costs, fast execution, and gives high impact. This strategy and recommendation propose to prepare farmers to face and overcome climate change and be able to guarantee the country's food supply even when faced with disasters and the consequences of this climate change. Under this strategy there are five programs and projects that can be carried out to overcome the challenges.

The first program is the Climate Change Management Crisis Course to Farmers. The program is expected to help farmers cope and prepare for climate change. This program will be held every year and targeted to all farmers. In this program, MAFI experts will teach and train farmers or participants to be prepared and could face climate change issues. This is because MAFI has many experts from various departments and fields in agriculture who can overcome threats such as the problem of infectious disease among animals/livestock (Hibrahim, 2021), and unsustainable agricultural practices that can cause climate change. The target or KPI for this program is 100% of all Farmers will get involved. Every year the target is the same until the end of this plan which is year 5. Every year this program must be executed and will benefit all farmers in Malaysia. MAFI, DOA, DVS, DOF and MARDI is the agency in charge for this

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program which all departments under MAFI will involve and MARDI will provide their module based on their research and experts. Budget for this program is RM10 million per year and will be held all over Malaysia.

The second program is the Climate Change Management Crisis Course to Fishermen which is to prepare a fisherman facing difficulties in obtaining results because of climate change. This program is only specific to all types of fishermen in Malaysia and will be held every year. Experts from MAFI are responsible for giving fishermen training and knowledge by providing necessary modules suitable for current situations to help fishermen be able to cope with a current situation. The agencies that will be in charge for this program are MAFI, DOF, and Malaysian Fisheries Development Authorities (MFDA) which also known as LKIM). Budget for this program is RM2 million per year and will be held all over Malaysia.

The third program is to provide financial loan assistance to use modern technology. Purpose of this program is to provide financial help for farmers who use contemporary technologies or modern technology should be provided to prepare farmers to face the effects of climate change. Specific loans will be provided to farmers who want to use the new technology. The First program initiative identifies industries that need more technological advancement. After that, MAFI will provide information on modern technology that has been researched and developed for the agriculture industry. Deal with a bank which is Agrobank to expand their loan and open their opportunities to farmers. Last initiative is expanding the promotion of loan assistance and advanced technology to all parts of the country. A total of RM500 thousand will be allocated for this program every year for the purpose of promoting and making this program a success.

The fourth program is a competency strengthening course for technical service officers to assist farmers in new technologies**.** The program is dedicated to technical assistants as well as technical service officers in improving the efficiency of helping farmers use new technologies. Increasing technical service officers' capabilities through ongoing training to better assist farmers with a new technology. Experts will identify the areas that are critical which need to be improved. The expert will provide appropriate modules according to the current situation which the expert needs to keep up to date with the current situation to give training to technical services. The Human Resource

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Department and Development Division of MAFI and MARDI will in charge for this program and budget for this program is RM10 thousand every year.

The fifth program is to provide Insurance Scheme to affected agricultural yields**.** The program will offer specialized insurance for agricultural produce affected because of climate change as well as infectious diseases. This insurance will help the farmer prepare him for all the possibility that bad things will happen. The first initiative for this program is Identify which areas have a high-risk loss due to climate change and disease. To make this program successful, Agrobank will seek approval from Bank Negara Malaysia to offer insurance to farmers to offer new products. MAFI will help to spread awareness among farmers about the benefits of having insurance through the promotion and marketing for every year. The starting budget for this program is RM15 million and from year 2 until year 5 is RM500 thousand per year for marketing and promoting throughout various platform.

3. Encourage people that live in urban/semi-urban areas to participate in agriculture activities.

The next strategies thrust would be to encourage people that live in urban and in semi urban areas to participates in agriculture activities**.** In the urban and semi urban areas, there are still some of the people who did not have knowledge on agriculture due to their living conditions that are lacking exposure to agriculture compared with those who live in rural areas that are close to agriculture. Not to mention, there are also some young generations that lack education in agriculture and what agriculture can do for them. This strategy is under the second strategy of in the weaknesses and opportunities (WO) quadrant. This strategy was chosen after it was able to fulfil all the BOS elements which are not involved with the high cost, fast execution as well as being able to give high impact. Under this strategy, there are four programs that can be carried out for those who live in urban and semi urban areas that can be put into action.

The first program would be Sudut Keceriaan Tanaman**.** This program is to cultivate the interest among students to be involved in agriculture. It is because the interest in agriculture must be applied at a young age so that these students know how interested it is about agriculture. Not only that, at a young age they will also learn the importance of climate change as well as its impact on agriculture and food security. For this, the government can make paperwork for the budget for the program. The teachers also will be put into training on how to plant and decorate with botanical plants for their

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own class to make it more attractive by making some space in class just for these plants. These programs need good cooperation from both teacher and students because students can learn agriculture can be put into different ways that can attract interest. The KPI for this program is 100% involvement of all schools in Malaysia so that all students in schools are exposed to the agriculture sectors. The milestone of this program for year one is to make 20% or 2044 of schools involved. For year two, 40% or 4088 of schools will join the program. Which is gradually increasing for year five, it is expected that all 10220 schools will participate in the program. The persons in charge or agencies in charge are the Ministry of Agriculture and Food Industries and Ministry of Education. The budget per year for five years would be RM 51 million, RM 25 million from MAFI and another RM 25 million from MOE.

The second program that can be put into action is Agro Garden. This program is to encourage residents in urban and semi urban areas to participate in agriculture. This is the collaboration between MAFI and the local government. For this program, each house at least must have one or more types of edible plants and livestock that will not disturb the neighborhood. It is because some of the residents like plants that are not edible but only for aesthetic beauty which is a waste of space. Thus, for this program, the residents can turn their edible plants into beautiful and aesthetic designs which can be put into two in one function. Not only that, the fish, or any aquatic life that they keep as a pet would be better if it was edible because it would not become a waste just for aesthetic beauty. It is also an early preparation in case there is a crisis on food security so that they will be able to survive during that time. To encourage more residents to participate, the government can give awards of appreciation on which residentials areas that are beautiful and cooperatives so that many other residential areas would join the program. The KPI for this program is 60% residential in urban and semi urban Selangor to participate with the program for year one to year two would be around 12% to 24%. It will increase for year three to year five, which is expected to be 60% of residential areas will be involved with this program and the participation will be increased for whole states in Malaysia. The person in charge or agencies in charge would be MAFI and local government. The budget for this program would be RM 500 000, RM 25 000 from MAFI and another RM 25 000 would be from the local government.

Meanwhile, for the third program would be Tanam sendiri Jual Hasil Sendiri**.** Under this program, it is to encourage side incomes through agriculture. Those who have their own crops and want to sell it, the government can make a place for them to

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sell such as Pasar Tani. For this program, the participants can sell their own crops directly to customers without dealing with middle parties. By this, the price of their product is not too expensive and it's still in good condition. The MDEC and local government can provide business licenses and places for this program at a low price. Meanwhile, FAMA can help to promote their product through marketing. Not only that, by giving subsidies, it will encourage them more to participate in the program. By this, it is a good opportunity to become involved with agriculture as they will see it as business opportunities and will help those who want to have the extra side income. The KPI for this program is 20% of the participation for year one. From year three to year five the participation will increase between 36% to 60%. The person in charge or agencies in charge would be the Ministry of Entrepreneur Development and Cooperatives (MEDAC), Federal Agricultural Marketing Authority (FAMA) and local governments. The budget for the program would be around RM 5 million, of which each government agency will provide RM 1.6 million for the project.

Finally, is the fifth program which is Green Space**.** For this program, it is to promote those who live in a flat, apartment or condominium. It is because these residents had small square feet houses and their space is not so big for a big garden. Thus, with this program, it is to encourage them to be involved with agriculture. There are also a few plants that are suitable and do not need a big space if there is a small space and sunlight for the plants. Not to mention there are many small pots that are suitable for small spaces which will be convenient for them to use and due to this, MAFI can provide advertisements to participants with the program. The KPI for the program is 19.44 million of the 32.4 million total population that live in a flat, apartment and condominium in Malaysia to participate in the program. For year one, it expected 38.88 million or 12% of participants to participate in the program. For year two, the participation will increase by 7.776 million or 24% and year three, will be 11.664 million or 36% participation. Thus, the number for year four to year five, the number of participations is estimated around 15.552 million to 19.55 million or 48% to 60% which means 100% target of the KPI.

4. Encourage cooperation in agriculture project with other ministries and local government

Among the five strategies that was proposed in the WT quadrant, only the first strategy encouraged cooperation in agriculture projects with other ministries and local

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governments that fulfilled the three elements of BOS. The strategy was considered as low cost because the strategy does not necessarily involve monetary funds. Other than that, the process of the strategy implementation also is possible to be done within five years, thus making the strategy fulfil the fast execution element. Furthermore, the strategy also might leave a huge impact on MAFI, since it involves cooperation with the other party. Through the cooperation with the other ministries and local government, it will spread the influence and information about the importance of agriculture activities to society. There are five programs under this strategy to overcome the challenges.

The first program is expo to attract the interest of youth to participate in agriculture. Rahman (2020) stated that among a million of registered farmers in Malaysia, only 15 percent are youth, equivalent to 240,000 people Expo will be organized by MAFI in partnership with the Ministry of Youth and Sport (KBS) and Local Government to spark the enthusiasm of younger generations in participating in agricultural activities. Expo is an annual event that will be held in every state in Malaysia. MAFI and KBS will share a budget to promote agriculture as well as to launch a joint expo. After that, MAFI and KBS will promote through social media platforms to attract youth to participate in the expo. Meanwhile, local governments will help to promote their respective areas. Budget for this expo is RM14 million per year which is estimated at RM 1 million per state and KBS will also provide their allocation of RM1 million for every expo.

Second plan is to provide knowledge to small- scale farmers**.** Lack of knowledge causes these small-scale farmers to exist. Therefore, this plan is to provide knowledge to small-scale farmers to ensure that they have enough knowledge about entrepreneurship and overcome the problems that occur. This program will provide seminars to help farmers plan efficiently and be aware of market demand. The first initiative for this program is to identify potential small-scale farmers. MEDAC and MAFI collaborate and share a budget to organize this program together. MEDAC will help the farmers through training and give knowledge to plan efficiently and be aware of market demand. Budget from MAFI for this program is RM1 million per year and MEDAC also will provide a budget for this program.

Third program is to encourage small-scale farmers to switch to large-scale agriculture by providing fund assistance**.** For this program, the main target group is the farmers that have small-scale lands. By providing the fund assistance to the small-scale

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farmers, it will give opportunity for the farmers to improve their crops. The small-scale farmers can install the new agriculture method, such as a hydroponic system that does not require much space, water pump machine, tiered crop house, and others. Other than that, small-scale farmers are also able to purchase the high-quality seeds that can increase the crops productivity. MAFI will take initiative to spread the information about the fund assistance to the farmers through media mass. The KPI of the program by the end of the year is that the information can reach 100 percent of the total number of small-scale farmers in Malaysia. The agency that will oversee the program is MAFI and the Ministry of Communications and Multimedia, and the annual budget for the program is RM2 million.

The fourth program is Integrated Operation to Monitor the farmers activity**.** MAFI together with the local government will cooperate in operation to monitor the farmers' activity. This program can improve the quality of monitoring of the country's agricultural activities and this collaboration helps MAFI overcome the lack of staff to monitor as well as support from local governments is seen to be more helpful because they know more about the situation in their area. The first initiative of this integrated operation identified places that have been gazetted as specialized agricultural areas such as paddy fields. Then, MAFI collaborates with the respective local government together patrolling and monitoring. This integrated operation will perform monitoring on a periodic basis once every three months at each location that has been identified. The KPI of this program is to implement integrated operation every three months of the year and consistent three operations every year. The MAFI, DOA, local government, and MADA will oversee this integrated program and budget for this program is RM5,000 per year.

The last program is the establishment of food security committees in every state. This program will establish food security committees in every state. MAFI can make good cooperation with other ministries and local governments to make a project that benefits them so that it will produce good outcomes as well as to help to cater the issues of climate change and food security. Not only that, but it also shows how important agriculture is to the country. Every state in Malaysia should have their own food security committees to address issues quickly and effectively on food security in their respective states. The first initiative is structuring the organization of the committee. Next, set up the place and budget allocation for this committee. Then, prepare the proper documentation about the roles and functions of the food security committee. This

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program collaborates between MAFI and the state government together to set up a committee.

Conclusion and Move Forward Actions

In conclusion, as a developing country, it is essential for Malaysian administrators to be able to control the stabilization of agriculture activities. Due to climate change, the administrators need to increase the research and development process, so the productivity of agricultural products can be maintained, thus contributing in the development of economic growth. Through the implementation of the programs that were proposed under the first Strategic Thrust, it will contribute to the improvement of agriculture output. When the local farmers are able to improve agricultural activities through innovation and technology, it will increase the quantity and quality of the output. The high quality and quantity of the crop production will contribute to overcome the food security issue in Malaysia. Other than that, it also will give the opportunity for the farmers in Malaysia to contribute to the trade activity through the product export. High demand for exported products will increase economic growth, thus increase the stability of the Malaysian economy.

Secondly, the implementation of this strategy can assist farmers in better preparing for the number of challenges that may arise because of changes in the climate. Aside from that, MAFI is also capable of enhancing the quality of the services they provide to the agricultural business and the food industry.

Thirdly, through the implementation of this strategic plan, collaboration between the Ministries may be established and enhanced. This is since many different ministries and government agencies will need to work together to implement this strategy. In addition, the implementation of this strategy can assure that our nation will be able to adapt to the effects of climate change and that it will be possible to attain food security.

Finally, these plans also will increase the awareness among public people because it involves their participation especially about the climate change and effect on food security. By being involved with the plan, the awareness will be increased and at the same time, it benefits them because they can have their own agriculture. Not to mention, it also will help them during the food security crisis.

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