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THE ROLE OF NATIONAL FOOD SECURITY IN A MASSIVE PANDEMIC: THE CASE OF COVID-19

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ABSTRACT

This paper proposes the national pandemics contingency plan for any country based on the application of the minimum food, water & medication storage for a massive pandemic quota (*ψ-Quota*). Consequently, the main objective of the *ψ-Quota* is to calculate the approximate amount of food, water, and medicines storage amount annually in case of a possible massive pandemic crisis. Finally, this paper is divided into three sections: (i) the minimum food, water, and medicine quota storage calculation in case of a massive pandemic; (ii) the food, water, and medicine storage quota for a massive pandemic; (iii) the geographical distribution and mapping of the emergency aid supplier's modules in case of a massive pandemic for any country. Finally, the *ψ-Quota* was applied on the case of Malaysia.

Keywords**:** Pandemics, Food security; economic development; COVID-19.

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1. INTRODUCTION

This paper proposes a strategic food security model for any massive pandemics' crisis. Initially, this research is interested to apply the minimum food, water & medication storage for a massive pandemic quota (ψ-Quota) in the case of COVID-19. The purpose of the ψ-Quota is to find the annual percentage of food, water and medication storage from the effective total agriculture and industry output plus the imported commodities from overseas that can prepare to any country for a potential massive pandemic. Hence, any country is able to build its own ψ-Quota policy framework based on the national basic food, water and medication consumption(s) (Maxwell, 1996). According to this research paper defined the food, water and medication storage quota policy as an integral national strategy to monitoring the effective and potential production, storage capacity, and geographical distribution systems (logistic and channels) according to the population concentration of any country. It is suggested in this paper that the ψ-Quota can be an alternative approach of analysis in the study any massive pandemic contingency plans anywhere and anytime. Additionally, we like to mention some interesting research works in our research such as Eele (1994); Gilmore & Huddleston (1983); Carr (2006); Carletto, Zezza, and Bannerjee (2013) about the evaluation of food security policy issues. These four research papers can show us different point of views about the food security policy issues from a qualitative and quantitative perspective. Moreover, this research recommends the uses of a large number of variables that need to be included in the process of constructing the ψ-Quota. All these variables have the same level of

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importance and are integrated into the same indicator and graphical space. From the mathematical perspective, the ψ-Quota is not a simple relationship between two variables (such as the endogenous variable and the exogenous variable) that are fixed into a specific period of time and space. Hence, the ψ-Quota requires a multi-dimensional variable analytical framework. In this framework no variable is isolated in the mathematical and graphical modeling. A multi-dimensional mathematical economics modeling in real time is used in the construction of the ψ-Quota. This is in order to avoid isolation of any variables in the construction of the ψ-Quota. The multi-dimensional mathematical economics modeling in real time is an alternative mathematical and geometrical approach to observe the behavior of a large number of variables that move within the same graphical space. This type of modeling requires simultaneous application of a multi-dimensional graphical modeling conceptualized under "Econographicology" (Ruiz Estrada, 2017). The multi-dimensional mathematical economics modeling in real time enables observation of all changes in different variables in the same graphical space. All these variables are changing constantly with time (years, months, weeks or days) in different parts within the same space. The application of the multi-dimensional mathematical economics modeling in real time opens up the possibility to formulate a food security policy for any country from a multi-dimensional perspective. The construction of the ψ-Quota varies from one country to another country. It varies according to the diet of the population, population size, geographical location, probabilities of suffering any time from a massive pandemic conflict and finally, the statistical resources available in the country. In the construction of the ψ-Quota, the presumption is that it is impossible to predict or forecast any massive pandemic request with accuracy relationship between a single exogenous variable and a single endogenous variable.

2. PRO AND CONS OF FOOD SECURITY INDICATORS

Initially, this research paper is interested to analyze pro and cons of nine different indicators about food security such as (i) dietary diversity (DD); (ii) Coping Strategy Index (CSI); (iii) food adequacy question (FAQ); (iv) non-food factors (NFF); (v) food consumption score (FCS); (vi) household food insecurity access scale (HFIAS); (vii) household survey food consumption data (HSFCD); (viii) undernourishment by Carletto et al., (2013). Additionally, in this section of this research also is willing to identify pro and cons of the *ψ-Quota* respectively (See Table 1).

Table 1. Pro and Cons of Food Security

INDICATOR	OBJECTIVE	PRO	CONS
The minimum food, water & medication storage for a massive pandemic quota (*ψ-Quota*)	*The ψ-Quota* is to find the annual percentage of food storage from the agricultural sector total output that can prepare any country for an eventual natural disaster or social conflict.	The *ψ-Quota* can easily calculate the approximate amount of annual food storage that any country needs to prepare for a potential natural disaster or social conflict.	Request a huge volume of data sources and a large database.
Dietary diversity (DD)	The indicator is usually measured by summing the total number of foods or	One of a number of faster measures that have been proposed	A primary problem associated with dietary diversity indicators

INDICATOR	OBJECTIVE	PRO	CONS
	food groups consumed over a given reference period, typically ranging from one to three days.	over the years as an alternative means of capturing food access is dietary diversity, which is of particular importance in developing countries where diets are composed mostly of starchy staples, include few or no animal products, and may be high in fats and sugars.	concerns the difficulty involved in interpreting comparisons across studies, since the food groupings as well as the reference periods often vary between approaches.
Coping Strategy Index (CSI)	The Coping Strategy Index (CSI) is similarly built around a 'behavioral' approach to food security analysis. The motivation for this indicator arises from the recognition that there are several common behavioral responses to food insecurity that are often used for the management of household food shortages.	The CSI is based on the weighted aggregation of information on the severity and frequency of a certain menu of possible coping strategies, developed and assessed based on location-specific assessments and appraisal methods such as focus group discussions. The tool is intended for application (1) in emergency situations to assess the food security situation, (2) for targeting purposes, (3) to serve as an early warning indicator, as well as (4) to monitor the impact of interventions and long-term changes in food security status.	On the other hand, their penchant for generating false positives creates potential problems, particularly in the context of targeting individuals for food aid in emergency situations.
Food adequacy question (FAQ)	The food adequacy question (FAQ) have been proposed and implemented in large-scale household surveys.	The advantages of this method lie in its simplicity as well as its ease and rapidity of deployment.	In terms of validation, the sole study of which we are aware that systematically attempted to validate the use of this question involved four multi-topic household surveys in different LDC's, and concluded that this indicator is at best poorly correlated with

INDICATOR	OBJECTIVE	PRO	CONS
			standard quantitative indicators.
Non-food factors (NFF)	The level food security outcomes concerns the various non-food factors that contribute to determining those outcomes: health and care inputs, feeding practices, and access to basic services such as clean water and sanitation.	The non-food factors while tried in a few countries with some success, the experience to date has not been particularly encouraging.	Some concerted effort may be needed to achieve consensus on a minimum set of questions and indicators that surveys should include, but this task is well within reach, given the existing degree of harmonization and comparability across some of these surveys in this particular domain.
Food consumption score (FCS)	A widely utilized variation on the dietary diversity theme is WFP's Food Consumption Score (FCS), which is a frequency-weighted dietary diversity score, calculated using the frequency with which a household consumed eight food groups (i.e., staples, pulses, vegetables, fruits, meat/fish/egg, milk, sugar, and oil) with a 7-day recall from the date of the survey.	The FCS also lacks the ability to differentiate between processed and unprocessed foods, which has implications for food security, particularly in terms of food utilization.	A review and validation of food security indicators by IFPRI in 2006 concluded that the weighting system for the food frequency scores might not be able to accommodate variation across space and time. Further- more, due to the high survey data requirements for creating appropriate weighting factors for a given location and time, the indicator is also unsuitable for emergency assessments, given that the pattern of significant food groups has been found to vary by country and even from one survey round to the next.
Household food insecurity access scale (HFIAS)	The Household Food Insecurity Access Scale (HFIAS) is based on the idea that there is a set of predictable reactions to the experience of food insecurity that can be summarized and quantified, allowing for measurement through household surveys.	The HFIAS questions thus represent universal aspects of the experience of food insecurity, capturing information on food shortage, food quantity and quality of diet to determine the status of a given household's access to food.	The authors suggest that more cognitive testing should be conducted in order to capture the experience of uncertainty and anxiety over food supply as it exists in developing country. They also suggest that more testing of the

INDICATOR	OBJECTIVE	PRO	CONS
		Households and populations can be classified according to the severity of their food security status along a spectrum, by using data on the severity and frequency of their experiences over the previous 30 days.	progression of the scale items within the local context could serve to explain minor inconsistencies in their results.
Household survey food consumption data (HSFCD)	Nonetheless, detailed food consumption expenditure information is the back-bone of poverty measurement in most countries, thus making the collection of this type of data essential for all countries, irrespective of the difficulties and costs entailed. Ensuring that food quantities are collected alongside expenditure information renders possible the applicability and use of this information for food security monitoring and analysis.	While the move to the exclusive use of household surveys to derive global undernourishment figures may not itself be fully practical, more and better food consumption data from household surveys is likely to be a game-changer in improving the FAO undernourishment estimates.	It is important to recognize that the issue of frequency of data is unlikely to be fully addressed on a global scale by household surveys alone, as the likelihood of generating comparable household survey data on a frequent basis from every country is extremely low.
Undernourishment	To quantify food security at the national level by capturing the average availability of food against requirements at the national level.	The advantage of the FAO measure is that it allows for frequent updated comparisons of energy deficiencies across countries and over time.	The fact that it relies on often poor quality data for the calculation of total food/calorie availability (i.e., the Food Balance Sheets), and on parametric assumptions and often outdated survey data for the analysis of the distribution. An additional drawback is that the official FAO method is not amenable to the analysis of determinants of profiles of food insecurity below the national level.

Source: Carletto, Zezza, and Banerjee (2013).

3. AN INTRODUCTION TO THE MATHEMATICAL ECONOMIC MODELING IN REAL TIME

Multi-dimensional mathematical economics modeling in real time requires the application of the *Omnia Mobilis Assumption* (Ruiz Estrada, 2011) which translated from Latin, means "everything is moving". The *Omnia Mobilis assumption* enables the location of different variables simultaneously in the same multi-dimensional physical space, showing different dimensions and movements in real time. The Ceteris Paribus assumption was commonly applied to food policy modeling in earlier publications in different journals related to food policy and food security policy. This paper suggests contradictory that it is not necessary to apply the Ceteris Paribus assumption to an integral food, water and medication contingency policy modeling. Its argument is that no relevant variable should be isolated and considered less important to be accounted in the food policy modeling. The objective of applying the Omnia Mobilis assumption to mathematical economic modeling is to include more variables and not isolate any relevant variable in the food, water and medication contingency policy modeling. The multi-dimensional mathematical economics modeling in real time also assumes that the market is formed by many sub-markets. These sub-markets are always in a "*Constant Dynamic Imbalanced State*" (Ruiz Estrada & Yap, 2013). The concept of equilibrium in the multi-dimensional mathematical economics modeling in real time is considered as a leak momentum of balance among all sub-markets. It can appear any time, but when exactly this synchronized balance takes place cannot be predicted. From a graphical perspective, the multi-dimensional mathematical economics modeling in real time assumes that a single dependent variable and a single independent variable are non-existence. We only can observe the display of a large, single surface (see Figure 1). This single surface that is formed by a large number of independent variables are joined together in the multi-dimensional physical space. This single and large surface alerts us in case of any positive or negative changes among all variables in the same graphical space.

4. METHOD TO CONSTRUCT THE MINIMUM FOOD, WATER AND MEDICATION STORAGE FOR ANY MASSIVE PANDEMIC QUOTA (Ψ QUOTA)

The construction of the minimum national food security for a massive pandemic quota (μ-Quota) requires multi-dimensional mathematical economics modeling in real time that is conceptualized under "Econographicology." The multi-dimensional mathematical economics modeling in real time is possible with the use of a large general matrix. The following are the steps to construct the μ-Quota:

- ✓ First Step: the vector input data (v) collected daily on the agriculture production annually by regions using a standard format.
- ✓ Second Step: transfer the vector input data (v) to different databases (D) that are connected to a unique information data center.
- ✓ Third Step: plot all vectors input data (v) immediately onto different co-ordinates in the multi-dimensional physical space. One database is created for each of the sources. Some examples of the sources are: the central bank, ministry of agriculture, farms, national statistics departments, and public and private research institutes.

The plotting on each co-ordinate is constantly changing. It is based on the use of multi-dimensional graphical modeling in real time (see Expression 3). Basically, the data is changing in real time. The plotting compares the data between two periods of time: the last period of time (-t) and the next period of time (+t).

5. AN INTRODUCTION TO THE MINIMUM FOOD SECURITY FOR A MASSIVE PANDEMIC QUOTA (M-QUOTA)

The construction of the minimum food security for a massive pandemic quota (μ-Quota) starts with the construction of an input-output i x j represented by Expression (1).

$$X_{ij:vn} = \begin{pmatrix} X_{11:v1} & X_{12:v2} & X_{13:v3} \\ X_{21:v4} & X_{22:v5} & X_{23:v6} \\ X_{31:v7} & X_{32:v8} & X_{33:v9} \end{pmatrix} \text{ x } 100\% \quad (1)$$

Vn = vector input data **X** = variable(s) **j** = column **i** = row

It is suggested that nine variables of performance represented by a matrix three by three are used. These variables of performance in our model is (i) the large and medium total farms output growth rate ($X_{11:v1}$), (ii) the imports of agriculture products growth rate ($X_{12:v2}$), (iii) exports of agriculture goods (in tons) growth rate ($X_{13:v3}$), (iv) the small agriculture producers output growth rate ($X_{21:v4}$), (v) labor demand and supply in the agriculture sector (in thousands) growth rate ($X_{22:v5}$), (vi) land for agriculture demand and supply (in KM^2) growth rate ($X_{23:v6}$), (vii) subsidies to the agriculture sector (in millions of US$) growth rate ($X_{31:v7}$), (viii) water supply to plantations and small farms (in tons) growth rate ($X_{32:v8}$), (ix) fertilizers and machinery for agriculture sector growth rate ($X_{33:v9}$). Each variable of performance is based on a growth rate: Each variable of performance should be based on the uses of growth rates. The next step is the storing of information in the database (D) represented by a matrix. (See Expression 2) The matrix consists of information saved in real time (☼) and the application of n-derivative $v = f^{\lambda}(\partial Y_0/\partial X_0, \ldots, \partial Y_\infty/\partial X_{\infty\ldots})$ on each vector input data (v = 1, 2, 3,…,9) and a large number of successive derivatives are running infinite times ($\lambda = 0, 1, \ldots, \infty\ldots$).

$$D_{ij:vn} = \begin{pmatrix} ☼\partial X_{11:v1<+t>}/\partial X_{11:v1<-t>} & ☼\partial X_{12:v2<+t>}/\partial X_{12:v2<-t>} & ☼\partial X_{13:v3<+t>}/\partial X_{13:v3<-t>} \\ ☼\partial X_{21:v4<+t>}/\partial X_{21:v4<-t>} & ☼\partial X_{22:v5<+t>}/\partial X_{22:v5<-t>} & ☼\partial X_{23:v6<+t>}/☼\partial X_{23:v6<-t>} \\ ☼\partial X_{31:v7<+t>}/\partial X_{31:v7<-t>} & ☼\partial X_{3:2:v8<+t>}/\partial X_{32:v8<-t>} & ☼\partial X_{33:v9<+t>}/\partial X_{33:v9<-t>} \end{pmatrix} \text{ x } 100\% \quad (2)$$

In the case of the vector input data changes in real time (☼∂) is based on running a large number of partial derivatives simultaneously, we are comparing the data we obtained a day before (<-**t**> = last period of time) and the information of today (<+**t**> = next period of time) according to Expression 3.

$$☼\partial X_{ij:vn<t>} = ☼X_{ij:vn<+t>} - ☼X_{ij:vn<-t>} / ☼X_{ij:vn<-t>} \quad (3)$$

The calculation of the final determinant is based on the Expression (4) below under final time of analysis <t>:

$$\Delta\Pi_{ij:vn} = \begin{pmatrix} \text{☼}\partial X_{11:v1\langle t\rangle} & \text{☼}\partial X_{12:v2\langle t\rangle} & \text{☼}\partial X_{13:v3\langle t\rangle} \\ \text{☼}\partial X_{21:v4\langle t\rangle} & \text{☼}\partial X_{22:v5\langle t\rangle} & \text{☼}\partial X_{23:v6\langle t\rangle} \\ \text{☼}\partial X_{31:v7\langle t\rangle} & \text{☼}\partial X_{32:v8\langle t\rangle} & \text{☼}\partial X_{33:v9\langle t\rangle} \end{pmatrix} \text{ x } 100\% \tag{4}$$

The next step is to measure the µ-Quota by year. To get the µ-Quota, multiply the final determinant of the matrix of agriculture performance ($\Delta\Pi_{ij:vn}$) by the actual final total agriculture output annually (O%) then divide by the annual population growth rate (ΔPop%) (see Expression 5).

$$\mu\text{-Quota} = (\Delta\Pi_{ij:vn}) \text{ x } (O\%)/(\Delta Pop\%) \tag{5}$$

The final step is to measure the minimum food security for any massive pandemic quota (µ-Quota) final amount: Firstly, we need to apply a logarithm on the expression 5. Hence, the final µ-Quota-Final-Amount is equal to divide 1 by expression 6.

$$\mu\text{-Quota-Plan-Final-Amount} = 1/\text{Log } \mu\text{-Quota} \tag{6}$$

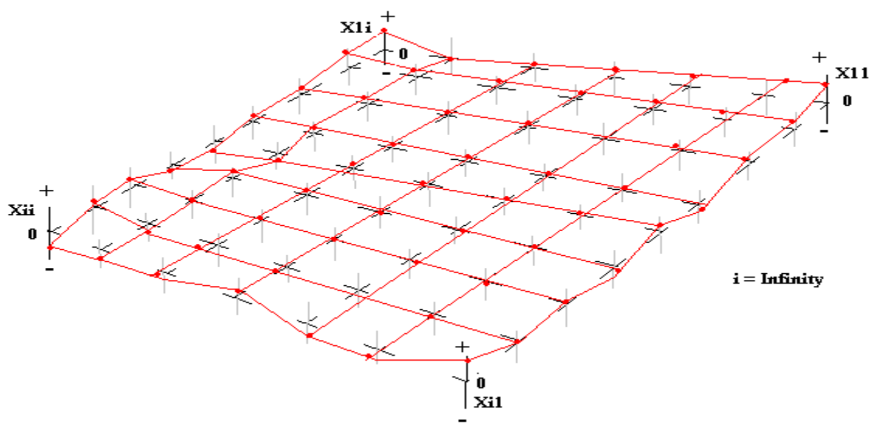
6. THE MINIMUM FOOD SECURITY FOR A MASSIVE PANDEMIC QUOTA SURFACE (M-QUOTA-SURFACE)

The full implementation of the µ-Quota-Surface requires one fourth phase, that is, the construction of the µ-Quota-Surface. The purpose of constructing the µ-Quota-Surface is to visualize graphically all results in the µ-Quota-Matrix variables performance (see Expression 4). The µ-Quota-Surface allows graphical visualization of strengths or weaknesses points in any research about food security policy modeling for any possible massive pandemic (see Figure 1). The construction of µ-Quota-Surface depends on the µ-Quota-Matrix variables performance final results. The µ-Quota-Matrix is a three-by-three matrix that contains the individual results of all nine-performance main-variables. The idea is to use results of strictly nine performance main-variables in the µ-Quota-Matrix to build a symmetric surface. When the µ-Quota-Matrix keeps strictly the same number of rows and columns, then the µ-Quota -Surface can always show a perfect symmetric view (see Expression 7).

$$\mu\text{-Quota-Surface} = \begin{pmatrix} X_{11(v1)} & X_{12(v2)} & X_{13(v3)} \\ X_{21(v4)} & X_{22(v5)} & X_{23(v6)} \\ X_{31(v7)} & X_{32(v8)} & X_{33(v9)} \end{pmatrix} \tag{7}$$

The result of each performance main-variable in the μ-Quota-Surface is evaluated according to four levels of performance. If the result of the performance main-variable in the μ-Quota-Surface is between 1 and 0.76, then this main-variable has an 'excellent performance'. If the performance main-variable has a result between 0.75 and 0.51, then it is of 'good performance'. If the performance main-variable has a result between 0.50 and 0.26, then this performance main-variable is of 'acceptable performance'. If the performance main-variable in the μ-Quota-Surface shows a result between 0.25 and 0, then this performance main-variable has 'non-satisfactory performance'.

Figure 1: μ-Quota-Surface

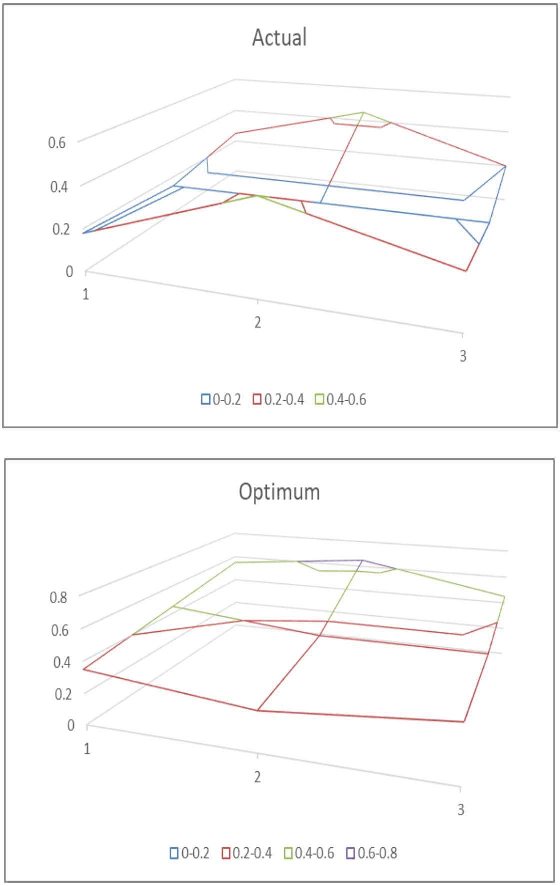


Source: Econographicology (2017)

7. THE APPLICATION OF THE M-QUOTA IN COVID-19: THE CASE OF MALAYSIA

Recently, Malaysia is experiencing the largest worldwide pandemic of the Century XXI such as COVID-19. Actually, the COVID-19 affects a large number of Malaysians with a total of 1,800 infected victims and 20 death people until end of March 2020. On the other hand, we can observe a galloping inflation in the food sector of thirty-five percent. At the same time, Malaysia also can experience anytime a large food shortage. The main reason of a possible large food shortage is originated from the limited Malaysian agriculture production to supply enough food to thirty-one millions of Malaysians. In the last twenty years, Malaysia start to depend highly on the import of agriculture products and food from many neighbors' countries such as Indonesia, Thailand, and Philippines. According to this research, the Malaysian food industry is only able to supply food to 35% of the total Malaysian market (65% from overseas). Hence, the Malaysia food market shows a high dependency on imports that makes Malaysia highly vulnerable in case of a massive pandemic, in our case COVID-19. The second source of food for Malaysia is from far countries that supplied 30% of the total food that is originated from U.S., Australia, New Zealand, China, and EU. This study shows that the Malaysian agriculture production is focused on rice, local fruits, fresh vegetables, palm oil, some species, sea food, eggs between 2017 to 2019 (2 years) shows a small expansion of +20% growth rate compare to the food consumption growth rate with +40% according to government reports. Therefore, Malaysia consumes the double than they are able to produce. In fact, to satisfy the large Malaysia food demand incurs on massive imports of agriculture commodities that can help to complement the domestic consumption in very short periods of time. The poor Malaysian agriculture performance needed a deeper reform and transformation to catch-up the domestic demand and some basic food storage in the case of any national emergencies such as the case of COVID-19. At the same time, the large demand of agriculture imported goods is affecting directly on the balance trade deficit of Malaysia. In fact, Malaysia became more vulnerable recently with COVID-19. Hence, this paper proposes the application of μ-Quota in the case of Malaysia. This paper is of the view that the creation of a stable food security policy in case of a massive pandemic can considerably decrease the vulnerability of Malaysia in all levels. Therefore, it suggests that Malaysia should take into consideration a wide range of variables of performance such as (i) the large and medium total farms output growth rate ($X_{11:v1}$), (ii) the imports of agriculture products growth rate ($X_{12:v2}$), (iii) exports of agriculture goods (in tons) growth rate ($X_{13:v3}$), (iv) the small agriculture producers output growth rate ($X_{21:v4}$), (v) labor demand and supply in the agriculture sector (in thousands) growth rate ($X_{22:v5}$), (vi) land for agriculture demand and supply (in KM^2) growth rate ($X_{23:v6}$), (vii) subsidies to the agriculture sector (in millions of US$) growth rate ($X_{31:v7}$), (viii) water supply to plantations and small farms (in tons) growth rate ($X_{32:v8}$), (ix) fertilizers and machinery for agriculture sector growth rate ($X_{33:v9}$). This paper maintains that it is necessary to incorporate these sorts of factors in the food security policy modeling in order to formulate strong policies of minimal vulnerability possible. However, it must be assumed that all these factors maintain a constant quantitative and qualitative transformation(s) in different historical periods of the society concerned. According to our model in this study, the final results shows that the growth rate from 2017 to 2018 (2 years) is followed by: (i) the large and medium total farms output growth rate (actual = 0.18/ optimum = 0.35 [deficit = -0.17]), (ii) the imports of agriculture products growth rate (actual = 0.45/ optimum = 0.25 [deficit = -0.20]), (iii) exports of agriculture goods (in tons) growth rate (actual = 0.25/ optimum = 0.35 [deficit = -0.10]), (iv) the small agriculture producers output growth rate (actual = 0.15/ optimum = 0.45 [deficit = -0.30), (v) labor demand and supply in the agriculture sector (in thousands) growth rate (actual = 0.15/optimum = 0.35 [deficit = -0.20]), (vi) land for agriculture demand and supply (in KM^2) growth rate (actual = 0.15/ optimum = 0.35 [deficit = -0.20]), (vii) subsidies to the agriculture sector (in millions of US$) growth rate (actual = 0.25/ optimum = 0.55 [deficit = -0.30]), (viii) water supply to plantations and small farms (in tons) growth rate (actual = 0.45/ optimum = 0.65 [deficit = -0.20]), (ix) fertilizers and machinery for agriculture sector growth rate (actual = 0.20/ optimum = 0.45 [deficit -0.20]) (see Figure 2). According to our final results for Malaysia shows a coefficient (determinant) $\Delta\Pi$ of 0.27.

Figure 2: μ-Quota-Surface: Actual and Optimum Malaysia (2017-2018)



Source: BNM (2020); Department of Statistics Malaysia Official Portal (2020); Ministry of Agriculture and Food Industries (2020).

According to the ψ-Quota requests the uses of the population growth rate (ΔP%) of Malaysia. According to world bank' the population growth rate of Malaysia in year 2018 is equal to 1.3%. The time of food sustainability (T) in the ψ-Quota for Malaysia is equal to 28 days. It is means that Malaysia is available to survive for 28 days without any worries (3 meals per day) for 85% of Malaysians in any massive pandemics such as the case of COVID-19. If we apply our formula ψ-Quota (annually) then we get a final result of 3.65%. This result explains to us that Malaysia needs to storage or safe food monthly 3.65% from the total output of the Malaysian agriculture production. Hence, the Malaysian government and private sector needs to coordinate actions with a general policy (technical aspect) and institutional coordination (implementation aspect) to storage 3.65% from the total output of the Malaysian agriculture production annually. The Malaysian agriculture sector has a share that is equal to 17% from the total GDP (by production).

8. POLICY RECOMMENDATIONS

The idea to create the ψ-Quota is to build a practical indicator about food security policy modeling respectively. Therefore, the contribution of this paper can be considered an alternative indicator in food policy modeling for researchers, policy makers and academics. In the evaluation of food security policy modeling this paper is considering three important factors: First factor is that the absence of new variables, including unforeseen and intangible forces, can cause a high level of vulnerability in the food security policy modeling." The ψ-Quota can show clearly the strengths and weaknesses of any food policy modeling from a multidimensional perspective. The ψ-Quota is available to fix the amount of food that any country need to storage for any massive pandemics. It is possible to be observed in the case of the ψ-Quota for Malaysia that they need to storage annually 3.65% from the 17% of the total agriculture total output. If Malaysia is able to storage a basic basket of commodities such as rice, palm oil, and sugar annually from the agriculture total output a share of 3.65% then they can supply food perfectly for fourteen days to 85% of whole Malaysians according to our indicator. Finally, this indicator can facilitate the planning of the Malaysian food security policy for COVID-19.

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