

Estimating the Export Supply Function of Flowers

Case Study: The Dutch Rose of Fars Province in the Region of Persian Gulf

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The main purpose of this study was to determine the factors affecting the export of flowers in Iran. After data collection using by the index of Revealed Comparative Advantage (RCA), the condition of business of flowers in Iran was compared with a number of countries exporting the product. According to the results of study, the small elasticity of the exportation price in the function of export demand is negative and smaller than one, and it indicates that flowers are inelastic goods; moreover, the income from its export could be increased by increasing the price. It can be concluded that the domestic price increase will lead to a decrease in exports due to the high elasticity and negative of export supply in comparison with the domestic price. Partial elasticity obtained for the variable of the value of domestic production of flowers in the export supply function in this study indicates that uncontrolled increase production by increasing the acreage under cultivation makes the decrease of exportation price of flowers, and at the most it causes reducing of exportation income because of higher effect of low price in comparison with the effect of an increase in demand; thus, the income from the export of flowers can be increased by controlling the production and the value of export.

Abstract

Keywords: Comparative advantage, Export, Flower, Supply and demand functions.

INTRODUCTION

In the process of economic and trade globalization, the increase of share in trade is one of the important economic goals of various countries through the development of export to international markets by which the national economy development, growth, and dynamism will be followed. In Iran, the need to reduce reliance on oil revenues has been culminated in providing programs for the development of non-oil products and trying to export them that most of which has been allocated to agricultural products due to the situation of Iran and the region.

Iran is a large country with climatic diverse that twelve types of which are in different area of Iran out of fourteen ones, as such, it has been enjoying the natural talent for growing kinds of herbs such as flowers and ornamental plants. (Vali Biygi, 2006).

With a review of the production of flowers and plants in recent years in different countries, it could be found out that Iran has a way less share of global producing and trading of this product despite having a good diversity of climate, cheap and appropriate labor, adequate light value, frequency of cellulosic wastes and proximity to consumption markets in producing kinds of flowers and ornamental plants (Table 1).

Despite these favorable natural conditions, in recent years, the potentials of this sector in the country are not used correctly, and this industry has not been able to find properly its true role in non-oil export and creation of the value added. The provinces of Tehran, Markazi, Mazandaran and Khuzestan are the main areas of production of ornamental plants in Iran. The total acreage under cultivation of ornamental plants in 2002 exceeding 1.4085 ha including 9.74 ha of acreage of glasshouse, 4.1724 ha of acreage of plastic greenhouse, and 9.2285 ha of acreage of cultivation of open area; meanwhile, the number of producers in this sector is also 8432 people (Table 2).

Given the important role of non-oil exports including agricultural products, several studies have been conducted to investigate the various factors affecting the supply of these products. The results of Sarwar and Anderson (1990) showed that exchange rate fluctuations had a significant effect on the demand for US soybean export. Mukherjee's (1997) findings showed that the export of Indian agriculture was susceptible to the real exchange rate. The results of Qitmiri and Khavari (2000) showed that the export of agricultural products has a negative effect on export with the deviation of the real exchange; however, the exchange rate has a positive effect. Also, the findings of Baqiri and Chidhari (2000) on the export of carpet was performed showed that the exchange rate has a positive effect on the export of the goods. Khusravi (2000) findings attest a positive relationship between the exchange rate of the currency and the export. On the whole, it could be inferred by all these set of studies that taking optimal policies and reducing foreign exchange fluctuations can lead to the increase in the export of agricultural products. There are other studies in the literature of export that determine the factors influencing export. The results of Sarwar and

Table 1. The order and value of the main importing countries of ornamental plants (a thousand dollar).

Country	Rank (in year)					Value of production in 2002 (a thousand dollar)
	1998	1999	2000	2001	2002	
Netherlands	1	1	1	1	1	4350352
Colombia	2	2	2	2	2	551218
Italy	4	3	3	5	3	546448
Denmark	3	4	5	6	4	527271
Belgium	6	5	4	4	5	353620
Germany	10	9	8	8	6	296638
Kenya	13	12	9	10	7	238018
USA	5	7	6	7	8	236682
Canada	7	6	-	3	9	214900
France	14	14	13	14	10	214287
Iran	-	-	-	83	81	-

The source: The Food and Agriculture Organization of the United Nations (FAO).

Table 2. The level of production of acreage under cultivation of flowers and ornamental plants (1996-2002).

Year	Acreage under cultivation (Hectare)				Production		
	Glass greenhouse acreage	Plastic greenhouse acreage	Open area	Total acreage under cultivation	Clipped branch (a million branch)	In pot (a million pot)	Ornamental trees and shrubs (million trees)
1996	73.1	515.5	233.6	2889.2	711.3	49.3	42.2
1997	50	873.4	1974.9	2898.3	483.9	2.30	50.5
1998	77.5	1308.9	2074.2	3460.6	870.7	44.2	65
1999	76.9	1209.8	1828.3	3115	851.8	3.33	86.4
2000	117.3	651.7	2502.5	3386.5	827.5	34.5	62.3
2001	77.3	1518.3	2196.1	3788.6	1096.3	33.7	98.9
2002	74.9	1724.4	2285.9	4085.1	1240.8	32.2	134.3

The source: Bureau of flowers and ornamental plants, medicinal and Edible fungi of Ministry of Agriculture.

Anderson's (1990) study showed that the price of the goods, income, production and the rival's price of products has a significant impact on the US soybean export. In addition, the effective factors on the supply of pistachio export based on Qanbari Arablu (1998) study are the exportation price, domestic price and the value of domestic production. Definitely the elasticity of export to the domestic production has been negative despite of expectation. Khaliliyan and Farhadi 's (2002) findings were declaratory of high sensitivity of the export supply of agricultural products to the changes of domestic gross production.

The share of non-oil products, agricultural products in particular, as one of the most important items of non-oil export of international trade and export has not been that much significant despite the potential capacities and abilities. In this regard, there has been no exception in the trade and export of flowers and ornamental plants as one of the most important exportation products of agriculture. In other words, despite the potentials for floriculture and ornamental plants, and relative superiority of this product, the value of export of this product is very low compared to the international level and has failed to achieve its real position in world markets. This is due to the difficulties and problems of the production and the export that in the present study it was trying to survey some factors influencing the straits of the development of the export of this product using the estimated supply and demand functions of the export of flowers. Considering the importance of above items, the main purpose of this study was to determine the factors affecting the export of flowers in Iran.

MATERIALS AND METHODS

At first step the supply and demand functions of flowers in Iran were estimated, and then the state of production of this product in different countries was compared using the index of comparative advantage and in the end the target markets of export of Iran's flowers were determined in order of priority.

The first step in the analysis of time series variables is to survey the static variables. If a variable is not static, so to speak, the probability distribution of the variable changes over time, the regression analyses will be faced with a problem. So the static of variables can be studied through using Dicky-Fuller, augmented Dicky-Fuller (ADF), Phillips-Perron (PP), and Perron tests. In the present study, Perron test was used to investigate the static of variables. After studying the degree of static of variables by using time series data, the supply and demand functions of the export of flowers were estimated via using the econometric models.

Export demand function

The export demand for a product is influenced by factors such as the exportation price of the product, the global price of the export (the average price of goods in international markets), and the income of the importing countries; the value of production of other countries can be considered as an endogenous variable in the model of the export demand. As such the export demand

function in logarithmic form is defined as follows:

$$\text{Ln}X_t^d = a_0 + a_1 \text{Ln}PX_t + a_2 \text{Ln}PXW_t + a_3 \text{Ln}YW_t + a_4 \text{Ln}w_t + U_{1t} \quad (1)$$

In which:

X^d is the global demand for export, PX is the commodity export price index, PXW is the global price for export, YM weighted average of real income of importing countries, W is the value of production of goods in other countries, and U_t is the interference sentence.

The real income index of importing countries in the study of Goldstein and Khan (1978) is calculated as follows:

$$YW = \sum a_i Y_i, \quad i = 1, 2, \dots, n, \quad \sum a_i = 1 \quad (2)$$

In which:

α_i is the share of country "i" of the import of goods, and Y_i is the real income of country "i" (Gross Domestic Production at constant price).

In many studies, the importance of the effect of exchange rate on the export of agricultural products is emphasized. In addition, changes in the real exchange rate in comparison with nominal changes will have a greater impact on the export demand for agricultural commodities. Thus, the real exchange rate variable was added to the equation 1:

$$\text{Ln}X_t^d = a_0 + a_1 \text{Ln}PX_t + a_2 \text{Ln}PXW_t + a_3 \text{Ln}YW_t + a_4 \text{Ln}w_t + a_5 \text{Ln}W_t + U_{1t}$$

According to the above pattern, it is expected that the sign of the coefficients of variables is as follows:

$$\alpha_1 < 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 < 0, \alpha_5 < 0 \quad (3)$$

The following equation was used to calculate the real exchange rate:

$$ER_t = E_t \text{CPI}_{it} / \text{WPI}_{us} \quad (4)$$

In which:

ER_t is the real exchange rate, E_t is the official exchange rate (official market) in terms of domestic currency per US dollar, WPI_{us} is the US wholesale price index, and CPI_i is the consumer price index in country "i".

Equation 3 shows that the export demand function in the long term is not available at any time. Therefore, using the adjustment mechanism, it is assumed that the export rather than the difference between the demand for export at the time (t) and the actual value of export in the previous period (t-1) is modified:

$$\Delta \text{Ln}X_t = \gamma [\text{Ln}X_t^d - \text{Ln}X_{t-1}] + U_{2t} \quad \gamma > 0 \quad (5)$$

In Equation 5, γ is the adjustment coefficient; Adjustment function assumes that the value of export is adjusted in case of excess demand in the rest of the countries of the world. By setting equation 3 in equation 5, a function for estimating the export demand is achieved as follows:

$$\begin{aligned} \text{Ln}X_t^d &= C_0 + C_1 \text{Ln}PX_t + C_2 \text{Ln}PXW_t + C_3 \text{Ln}YW_t + C_4 \text{Ln}ER_t + C_5 \text{Ln}W_t + C_6 \text{Ln}X_{t-1} + U_{3t} \\ U_{3t} &= \gamma U_{1t} + U_{2t} \end{aligned} \quad (6)$$

In which:

$$C_0 = \gamma a_0, C_1 = \gamma a_1, C_2 = \gamma a_2, C_3 = \gamma a_3, C_4 = \gamma a_4, C_5 = \gamma a_5, C_6 = \gamma a_6$$

Export supply function

In general, export supply depends on the factors such as the exportation price of the product,

the domestic price, and domestic production of the product. Export supply function in logarithmic form was used as follows:

$$\text{Ln } X_{st} = \beta_0 + \beta_1 \text{Ln } (PX / P)_t + \beta_2 \text{Ln } Y_t + U_{4t} \quad (7)$$

In which:

X_{st} is the value of export supply, PX is the price of exported goods, P is the domestic price of goods, Y_t is the value of the production of goods inside the country, and U_{4t} is the interference sentence.

In the supply equation, it is assumed that when the price of the exportation commodity is increased in comparison with the domestic prices, the production will be more profitable to export. Therefore, exporters offer more products, then it is expected that the endogenous variable in each equation must be proportionate to the left of the equation because estimating the model is carried out simultaneously. Therefore, Equation 7 can be written as:

$$\text{Ln } PX_t = b_0 + b_1 \text{Ln } X_{st} + b_2 \text{Ln } Y_t + b_3 \text{Ln } P_t + U_{4t} \quad (8)$$

While it is expected that the coefficients of β_1 & β_2 in equation 8 is positive, the expected sign of b_i is equal to:

$$b_1 > 0 \quad b_2 < 0 \quad b_3 > 0$$

The exportation price is adjusted to the excess supply:

$$\Delta \text{Ln } PX_t = \lambda [\text{Ln } X_t - \text{Ln } X_{st}] + U_{5t}, \lambda > 0 \quad (9)$$

λ is the adjustment coefficient. In this framework, the exportation price has inversely a correlation with the excess supply. It will be as following by setting equation 8 in 9 and solving it according as PX_t :

$$\text{Ln } PX_t = d_0 + d_1 \text{Ln } X_t + d_2 \text{Ln } P_t + d_3 \text{Ln } Y_t + d_4 \text{Ln } PX_{t-1} + U_{6t}$$

$$U_{6t} = \frac{1}{1 + \lambda \beta_1} U_{4t} + U_{5t} \quad (10)$$

The coefficients of d_i are equal to:

$$d_0 = -\frac{\lambda \beta_0}{1 + \lambda \beta_1}, \quad d_1 = \frac{\lambda}{1 + \lambda \beta_1}, \quad d_2 = -\frac{\lambda \beta_2}{1 + \lambda \beta_1}, \quad d_3 = \frac{\lambda \beta_3}{1 + \lambda \beta_1}, \quad d_4 = -\frac{1}{1 + \lambda \beta_1} \quad (11)$$

Based on the signs β and $\lambda > 0$ it is expected that $d_3 > 0$ $d_4 > 0$ $d_1 > 0$ $d_2 < 0$

Identification of target markets

The main economic goal of every producer is to maximize their continuous profit in their own market of produced products. According to economic theories, this is highly dependent on the demand for this product, so knowing the characteristics of the demand party of the product including actual and potential clients, and future demand growth and other factors can be a strategy for the future of the countries in the export of their products.

Revealed Comparative Advantage Index (RCA)

Hussiyani *et al.* (2008) is used RCA for the importers of the product to detect the best available target markets. The index is in fact an indicator of lack of comparative advantage in those countries in which the value of this index is high. The result is that it is better for exporters to allocate their export to these countries. The abovementioned index calculation method is as follows:

$$RCA_{am}^i = \frac{\left(\frac{M_a^i}{M_i^i}\right)}{\left(\frac{M_a^w}{M_i^w}\right)} \quad (12)$$

In which:

M_a^i is the value of the import of country "i" of the commodity "a"; M_i^i is the total agricultural import of the country "i"; M_a^w , the total import of the goods "a" in the world; M_i^w is the total agricultural import of the whole world.

Revealed Symmetric Comparative Advantage Index (RSCA) is used in this study whose superiority to the RCA index is that it is symmetric, namely, the RCA index shows the comparative advantage of a product within 1 to ∞ , and the index is used as the following symmetric shape for this weakness.

$$RSCA_{ij} = \frac{RCA_{ij}-1}{RCA_{ij}+1} \quad (13)$$

RSCA index takes the values between -1 to +1. If they are positive, it means that there is a comparative advantage of export in the global marketplace; and the negative ones indicate the nonexistence of comparative advantage of export in the global marketplace. Moreover whatever the numerical value of the index is greater, the more appropriate it exposes the status of the product on the market studied, and it reveals more confident to be in the world market.

In addition to the above index, in this study, other indices were uses for prioritizing the target markets of the worldwide of flowers. The index m_1 is the index of the average of import during the period. The m_2 represents each country's share of world import, and whatever it is greater, it indicates how more that country has the share of import of goods. The m_3 is an index that shows how much of the import of the country is allocated to the considered goods. The m_4 indicates the lack of comparative advantage, which has already been explained. The m_5 is the average importation growth rate of each country. The m_w is also the weighted average of the aforesaid indices computed to facilitate the ranking of the target markets. The characteristics and definitions of these indices have been presented in Table 3.

To investigate the static condition of the pattern variables, *Perron* test was used in three different modes: the change in the intercept of the trend function (C), the change in the slope of the trend function (T), and the change in the intercept and the slope of the trend function (C & T). Given *Perron* unit root test results in Table 1, the null hypothesis of a unit root for all variables except between the exportation price and the world price of export is rejected at a significance level of 5%, and all variables except for the two foresaid variables are in the static level, which became

Table 3. The indices of determining the target market.

Index kind	Index definition
$m_1 = \overline{M_{ij}}$	The average of the import of goods "i" by country "j" during the period in study
$m_2 = \frac{M_{ij}}{M_w}$	The ratio of the import of goods "i" by the country "j", in the total import of country "j"
$m_3 = \frac{M_{ij}}{M_j}$	The ratio of the import of goods "i" by country "j", in the total import of country "j"
$m_4 = RCA = \frac{M_{ij}}{\frac{M_i}{M_w}}$	The unrevealing of comparative advantage of country "j" about the goods "i"
$m_5 = \sum_{i=1}^4 \left(\frac{m_i}{m_i}\right) / 4$	The average of growth rate of the import of goods "i" by country "j" in the analysis period
$m_w = \overline{M_{ij}}$	Weighted average of indices

The source: Pirastih *et al.* (2006)

static with once differentiating. The variables used, supply functions and the demand of export of flowers in Iran were estimated in a systematic model whose results were presented in Table 4.

R^2_{CN} computed for each of the equations in Table 4 shows that the variables included in each of the models were able to explain a large percentage of changes of the dependent variable. Moreover after the collinearity testing between variables, $\ln PXW_t$ variable completely excluded from the model and the collinearity problem is resolved due to the complete collinearity relationship with the variable $\ln PX_t$.

The results of estimating the model in Table 4 depending on the variables of level show that elasticity index of the exportation price of demand for the export of flowers is equal to -0.56, and it is expected that 1% increase in the export price index of Iran's flowers reduces the demand of export for this product by 0.56% , and because the effect of the price increase is greater than the effect of reducing demand for flowers then it can be concluded that the increase of the price of flowers makes the exportation income go up and the reduce of its price make the exportation income go down; hence, it leads somewhat into reducing of the revenues of greenhouse owners. In the case of the role of exportation price index in determining the value of the export of flowers in static conditions (difference of) it can be also said that a 1% increase in the exportation price index causes the decrease to the level of demand for Iran's flowers by 0.59 % and due to lack of elasticity in the price demand it can be feasible to increase the exportation income from raising the price of flowers. According to the above results, the income elasticity of demand for export of flowers in being static of variables at level is significantly different from zero and its value is equal to 1.59 which indicates the positive effect of the income of the applicant countries of Iran's flowers on request of flowers from Iran; besides it shows that a 1% increase in revenue of flowers importing countries, it will increase the export demand by 1.59%. In the case of being static of variables (difference of) the results in Table 4 show that a 1% increase in revenue of flowers importing countries makes the demand for Iran's flowers go up to 1.48%.

As it can be seen in Table 4, fluctuations in the real exchange rate have had a significant effect on the export demand of Iran's flowers. Export demand elasticity with respect to the real exchange rate in model estimated on the conditions of being static of variables at level is less than about 1.20 the elasticity calculated in the model depending on being static of variables (difference of). According to economic theories, the falling value of the exporting country's currency by reducing the price of exports in foreign currency leads into the increase of export demand, and the

Table 4. Coefficients from the estimation of supply and demand functions of the export of Iran's flowers.

Demand equation	Level area	Static mode	Supply equation	Level area	Static mode
C	3.42 (2.45)	2.22 (1.98)	C	1.56 (2.16)	1.12 (1.42)
PX _t Exportation price index of the goods	-0.56 (0.44)	-0.59 (0.45)	X _t The value of the export supply	1.48 (0.59)	1.42 (0.61)
YW _t Weighted average of real income of importing countries					
ER _t Real exchange rate	1.59 (1.12)	1.48 (0.99)	P _t Domestic price of goods	2.01 (1.95)	1.99 (1.98)
W _t Production of goods in other countries	1.20 (0.98)	1.29 (1.01)	Y _t The quantity of Goods produced inside the country	-1.72 (0.89)	-1.68 (0.88)
X _{t-1} The worldwide demand for the export of flowers with a lag	1.69 (1.05)	1.7 (1.02)	PX _{t-1} The index of the export price of goods with a lag	1.04 (0.71)	1.17 (0.7)
D71 Dummy variable of trade Liberalizing	2.12 (1.72)	2.16 (1.91)	γ the adjustment coefficient of supply function	0.89	-
γ the adjustment coefficient of supply function	1.52 (0.72)	1.49 (0.69)	-	-	-
R^2_{CN}	0.29	-	R^2_{CN}	0.78	0.75

The source: the findings of the research.

The values in parentheses mean the amount of the standard error of the variable

variable coefficient of the real exchange rate in the stationary state (difference of) and being static at level is equal to 1.20 and 1.29. This means that for every 1% increase in the real exchange rate the value of demand will increase respectively by 1.20% and 1.29%.

Positive elasticity of the value of production of goods in other countries in the mode of level and the difference of variables shows that the more production of flowers increases in other countries, the more value of the demand of Iran's flowers goes up. This seems that it indicates that firstly quantitatively speaking the production in other countries is considerably less than the production of flowers in Iran; and secondly, the demand for flowers is increasing in the world every year, although the production has been increased in other countries, the increase of demand for Iran's flowers is due to its high quality.

The dummy variable D 71 has a positive and significant effect on the demand for the export of flowers, it means that trade liberalization has led to increase of demand for export. It should be noted that trade liberalization started in 1992 and since then for D the number 1 and before 1992 the number 0 has been taken into consideration; the results of estimating the supply function in the context of being static of variables at level are better than the results of estimating the pattern in terms of being differential of variables. The exportation price elasticity with positive sign implies that the increase in the exportation price increases the export supply. The value obtained for this elasticity indicates that the supply of flowers was inelastic and a 1% increase in exportation price makes the increase of 0.68% in the value of exportation supply of this product.

The elasticity of supply apropos of the domestic production of flowers is equal to $-d_3/d_1$ that d_3 is the coefficient of Y_t and d_1 is the coefficient of X_t in the export supply function; in the export supply function in the level mode and differential is respectively equal to 1.16 and 1.18, then there is the expectation of the increase in export supply by improving the conditions of productivity and increasing domestic production that the signs of the coefficients in the model estimated also demonstrate this issue.

The elasticity of supply apropos of the domestic price of flowers in the export supply function in two modes of level and differential is equal to -1.35 and -1.4, so the export supply declines in parallel with the increase of the domestic price and then the exportation price goes up.

The value of the elasticity of export supply apropos of the exportation price with a lag (equivalent to $-d_4/d_1$ that d_4 is the coefficient of PX_{t-1} and d_1 is the coefficient of X_t in the export supply function) is equal to 0.65 in the mode of level with no variable and 0.75 in differential mode of variables. The variables of value and price with break in both models of the demand and supply of export have significant ether in the dependent variables, moreover it can be said that in recent years due to injecting foreign currency into the country a part of Iran's flowers has been exported by suitcase trade. However, despite the rise in price during a period and in the next period, the supply of export has been faced partially with decrease due to having a monopoly of few domestic companies on exporting this product and also the existence of problems such as lack of capital and facilities, exportation barriers, dependence on sales to few foreign companies (intermediaries) and etc.

In this section, it was dealt with the calculation of the index of comparative revealed advantage symmetric for different countries in the production of flowers for the period 1998 -2001. The results of calculation of the RSCA index for the selected countries are shown in Table 5.

CONCLUSION

As it can be seen in Table 5, according to the theory, the values of the RSCA index are between 1 and -1, hence Iran has no comparative advantage in the export of flowers among the 10 main exporting countries of flowers and the countries of Canada, Italy, USA, and Germany, and the countries of Kenya, Columbia, Ecuador, the Netherlands, Denmark and Belgium have the comparative advantage in the export of flowers. In the meanwhile, due to the small share of the export of flowers, the Netherlands is in the first place of the export volume of the whole country, and it

Table 5. The Calculation of RSCA index for some countries of the world.

Country	1998	1999	2000	2001
Netherlands	0.87	0.87	0.87	0.87
Colombia	0.95	0.94	0.95	0.93
Canada	-0.137	-0.1	-0.04	-0.03
Belgium	0.06	0.07	0.11	0.14
Italy	-0.132	-0.07	-0.05	-0.04
Denmark	0.6	0.56	0.55	0.55
USA	0.61	0.67	0.66	0.62
Germany	-0.59	-0.57	-0.53	-0.94
Ecuador	0.94	0.94	0.95	0.94
Kenya	0.95	0.96	0.97	0.97
Iran	-0.96	-0.97	-0.97	-0.96

The source: the findings of the research.

Table 6. prioritizing the target markets of flowers.

Weighted average of indices		
Rank	Country	The value of index
1	United Arab Emirates	17.8
2	Qatar	11.3
3	Kuwait	5.4
4	Oman	3.11
5	Saudi Arabia	1.23

The source: the findings of the research.

seems that Ecuador is in the next position. The abovementioned countries that have the comparative advantage in export, so to speak, they produce their flowers with lower cost and higher quality than other exporting countries, in case of increasing the quality and reducing the cost of production, they will be able to increase the share of the global market for flowers. In Table 6, prioritizing the target markets is done by using weighted averaging; average of indices of imports, share of global imports, import growth, unrevealing of comparative advantage and share of civil imports. The countries UAE, Qatar, Kuwait, Oman, and Saudi Arabia are of the most importation advantages.

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