Annals of "Dunarea de Jos" University of Galati
Fascicle I. Economics and Applied Informatics
Years XXVII – n°3/2021
ISSN-L 1584-0409 ISSN-Online 2344-441X
www.eia.feaa.ugal.ro

DOI https://doi.org/10.35219/eai15840409229

The Tropical Fruits's Statistical Planet

Gabriela OPAIT*

A R T I C L E   I N F O

Article history:
Accepted December 2021
Available online December 2021
JEL Classification
C1, C12, C2

Keywords:
vitamins, minerals, fibres, carbohydrates, energy's boost

A B S T R A C T

The tropical fruits give rise to a lot of enjoy for the consumers thanks to their sweet, flavour and nutritional benefits. This original research has as aim the display of the worldwide productions's previsions, between 2021-2025, concerning the next tropical fruits: oranges, bananas, lemons, mangoes and papayas. The tropical fruits exhibit a lot of vitamins, antioxidants, magnesium, potassium and fibres. For these nutritional values, the tropical fruits represent a real "munitions" for people through they combat against the diseases, the rises in weight and for to lessen signs of aging.

1. Introduction

The tropical fruits with a „conglomerate" of 2700 species represent a source for the people's health. The oranges represent a significant well of benefits for the people's health, as a result of the wealthy content in vitamins, minerals, fibres, potassium, magnesium and beta-caroten.

The oranges contribute to: the rise of the immunity system, the blood pressure values's tuning, the cholesterol values's shrinkage which is an important vector in the strategic management regarding the heart's wellness, the support in the achievement of the collagen which is a prominent and „smoother" protein for the skin's health and the combat against the ageing process, the improvement of the diabetes treatment and also, the aid in anemia treatment.

The impressive positive effects concerning the bananas's consumption are a multitude, such as: the improvement of the heart's health, the refinement of the skin's health, the risk of cancer's shrinkage, a superlative hair's health, the acceleration concerning the weight's diminution, exquisite digestion's health, the promotion concerning the bones's health, the speed's reduction regarding the senescence process, maintaining optimum blood pressure. The bananas constitute a superfood thanks to the high level in nutrients: vitamins (B6, C), minerals, magnesium, potassium, fibres, carbohydrates and sugar.

The powerful health benefits of the lemons are significant and they display the best ways to boost our metabolism. Because the lemons contain a lot of nutrients such as: calcium, magnesium, potassium, iron, fibres, vitamins A, B and C, these help in many phenomenons: detox, the rise of the immunity system, the reduction of the weight, the improvement of the digestion, the rise of the satiety as a result of the pectin which exists in the lemons's peel and pulp, the decrease of the risk concerning the heart disease as effect of the cholesterol's improvement.

Mango contains a big source of magnesium, potassium, the vitamin A, vitamin K, vitamin C and fibres. Through the help of the constituent built in mangiferin, the mangos can lessen the heart's inflammation. Mango rises the level of the immunity as effect of the vitamin C which is a real aid for cartilages, muscles and also, for the collagen which occurs in bones. Mango ensures protection against for the free radical damage and too, mango is used as anti-inflammatory, anti-diabetic, anti-obesity effects, because this tropical fruit owns phytochemicals. As well, mango achieves a good digestion, respectively mango meliorates the sleep since the vitamin B_6 is a vector for the apparition of the serotonin which improves the slumber. Likewise, mango is recommended for to obtain a clear vision, because this fruit is riched in vitamin K and also, in antioxidants as luten and zeaxanthin.

Papaya exhibits a real wealth afforded by antioxidants, fibres and the vitamin A, vitamin B, vitamin C and vitamin K. Too, papaya achieves the decrease of the cholesterol's values and the diminution regarding the level of the stress. Papaya represents a true „warrior" which fights against the obesity. As well, papaya cans to swell the level of the immunity and to improve the digestion.

In the first episode of this research, we can focus the predictions concerning the oranges's worldwide productions between 2021-2025. In the second section of this statistical investigation, we can see the forecasts regarding the bananas's worldwide productions in the same interval. In the third part, we can

*Dunarea de Jos University of Galati, Romania. E-mail address: gabriela.opait@ugal.ro.

observe the previsions concerning the lemons's worldwide productions between 2021-2025. In the fourth and the fifth episode, we can meet the predictions regading the mangos's worldwide productions, respectively the papayas's worldwide productions between 2021-2025.

The prevision's method was inserted in this original researh for the achievement of the reflections concerning the next worldwide productions for oranges, bananas, lemons, mangos and papayas. Johann Carl Friedrich Gauss was the craftsman who offered shine and color for any statistical prognosis through the emergence of the „Least Squares Method".

2. The prognosis concerning the oranges's worldwide productions between 2021-2025

Table 1 The oranges's worldwide production between 2012-2020

YEARS	THE ORANGES'S WORLDWIDE PRODUCTION (millions tons) (ξ_i)
2012	49,85
2013	52,08
2014	48,94
2015	47,06
2016	53,86
2017	48,27
2018	54,24
2019	46,05
2020	48,57

Source: „Statista Portal the United States of America"

- if the procedure's architecture, which suggests the trend for the ξ variable, where ξ = **the oranges's worldwide production,** focuses as target a linear model, $\xi_{t_i} = a + b \cdot t_i$, *a* and *b* will be [3]:

Table 2 The realm of the values regarding the oranges'worldwide production, if this brings forward a linear projection

YEARS	THE ORANGES'S WORLDWIDE PRODUCTION (millions tons) (ξ_i)	LINEAR TENDENCY				
		t_i	t_i^2	$t_i\xi_i$	$\xi_{t_i} = a + bt_i$	$\lvert \xi_i - \xi_{t_i} \rvert$
2012	49,85	-4	16	-199,40	50,19555556	0,35
2013	52,08	-3	9	-156,24	50,00555556	2,07
2014	48,94	-2	4	-97,88	49,81555556	0,88
2015	47,06	-1	1	-47,06	49,62555556	2,57
2016	53,86	0	0	0	49,43555556	4,42
2017	48,27	+1	1	+48,27	49,24555556	0,98
2018	54,24	+2	4	+108.48	49,81555556	4,42
2019	46,05	+3	9	+138,15	48,86555556	2,82
2020	48,57	+4	16	+194,28	48,67555556	0,11
TOTAL	444,92	0	60	-11,40		18,62

$$a = \frac{\sum_{i=1}^{n}\xi_i \sum_{i=1}^{n} t_i^2 - \sum_{i=1}^{n}\xi_i t_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{444,92 \cdot 60}{9 \cdot 60} = 49,43555556 \quad b = \frac{n\sum_{i=1}^{n}\xi_i t_i - \sum_{i=1}^{n} t_i \sum_{i=1}^{n}\xi_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{9 \cdot (-11,40)}{9 \cdot 60} = -0,19$$

$$v_I = \left[\frac{\sum_{i=1}^{m}\left|\xi_i - \xi_{t_i}^I\right|}{n} : \frac{\sum_{i=1}^{m}\xi_i}{n}\right] \cdot 100 = \frac{\sum_{i=1}^{m}\left|\xi_i - \xi_{t_i}^I\right|}{\sum_{i=1}^{m}\xi_i} \cdot 100 = \frac{18,62}{444,92} \cdot 100 = 4,18\%$$

- if the procedure's architecture, which suggests the trend for ξ variable, where ξ = **the oranges's worldwide production,** focuses as target a quadratic model, $\xi_{t_i} = a + b \cdot t_i + ct_i^2$, *a* and *b* will be [3]:

Table 3 The realm of the values concerning the orange'worldwide production, if this brings forward a quadratic projection

YEARS	THE ORANGE'S WORLDWIDE PRODUCTION (millions tons) (ξ_i)	PARABOLIC TENDENCY					
		t_i	t_i^2	t_i^4	$t_i^2\xi_i$	$\xi_{t_i} = a + bt_i + ct_i^2$	$\lvert\xi_i - \xi_{t_i}\rvert$
2012	**49,85**	-4	16	256	797,60	50,18969697	0,34
2013	**52,08**	-3	9	81	468,72	50,00409091	2,07
2014	**48,94**	-2	4	16	195,76	49,81722944	0,88
2015	**47,06**	-1	1	1	47,06	49,62911255	2,38
2016	**53,86**	0	0	0	0	49,43974026	4,42
2017	**48,27**	+1	1	1	48,27	49,24911255	0,98
2018	**54,24**	+2	4	16	216,96	49,05722944	5,18
2019	**46,05**	+3	9	81	414,45	48,86409091	2,81
2020	**48,57**	+4	16	256	777,12	48,66969697	0,10
TOTAL	**444,92**	0	60	708	2965,94		19,16

$$a = \frac{\sum_{i=1}^{n} t_i^4 \sum_{i=1}^{n} \xi_i - \sum_{i=1}^{n} t_i^2 \sum_{i=1}^{n} t_i^2 \cdot \xi_i}{n\sum_{i=1}^{n} t_i^4 - \left(\sum_{i=1}^{n} t_i^2\right)^2} = \frac{708 \cdot 444{,}92 - 60 \cdot 2965{,}94}{9 \cdot 708 - 60^2} = 49{,}43974026$$

$$b = \frac{\sum_{i=1}^{n} \xi_i t_i}{\sum_{i=1}^{n} t_i^2} = -\frac{11{,}40}{60} = -0{,}19$$

$$c = \frac{n \cdot \sum_{i=1}^{n} t_i^2 \cdot \xi_i - \sum_{i=1}^{n} t_i^2 \cdot \sum_{i=1}^{n} \xi_i}{n\sum_{i=1}^{n} t_i^4 - \left(\sum_{i=1}^{n} t_i^2\right)^2} = \frac{9 \cdot 2965{,}94 - 60 \cdot 444{,}92}{9 \cdot 708 - 60^2} = -0{,}0006277056277$$

$$v_{II} = \left[\frac{\sum_{i=1}^{m} \left|\xi_i - \xi_{t_i}^{II}\right|}{n} : \frac{\sum_{i=1}^{m} \xi_i}{n}\right] \cdot 100 = \frac{\sum_{i=1}^{m} \left|\xi_i - \xi_{t_i}^{II}\right|}{\sum_{i=1}^{m} \xi_i} \cdot 100 = \frac{19{,}16}{444{,}92} \cdot 100 = 4{,}31\%$$

- if the procedure's architecture, which suggests the trend for ξ variable, where ξ **= the oranges's worldwide production,** focuses as target an exponential model, $\xi_{t_i} = ab^{t_i}$, *a* and *b* will be [3]:

Table 4 The realm of the values concerning the oranges's worldwide production, if this brings forward an exponential projection

YEARS	THE ORANGES'S WORLDWIDE PRODUCTION (millions tons) (ξ_i)	EXPONENTIAL TENDENCY					
		t_i	$\lg\xi_i$	$t_i \lg\xi_i$	$\lg\xi_{t_i} = \lg a + t_i \lg b$	$\xi_{t_i} = ab^{t_i}$	$\lvert\xi_i - \xi_{t_i}\rvert$
2012	**49,85**	-4	1,697665163	-6,790660651	1,704290929	50,61636218	0,77
2013	**52,08**	-3	1,716670976	-5,150012927	1,702538005	50,41247330	1,67
2014	**48,94**	-2	1,689663965	-3,379327930	1,700785080	50,20940559	1,27
2015	**47,06**	-1	1,672651923	-1,672651923	1,699032156	50,00715599	2,95
2016	**53,86**	0	1,731266349	0	1,697279232	49,80572106	4,05
2017	**48,27**	+1	1,683677299	1,683677299	1,695526308	49,60509755	1,34
2018	**54,24**	+2	1,734319681	3,468639362	1,693773384	49,40528217	4,83
2019	**46,05**	+3	1,663229635	4,989688904	1,692020459	49,20627155	3,16
2020	**48,57**	+4	1,686368103	6,745472414	1,690267535	49,00806269	0,44
TOTAL	**444,92**	0	15,27551309	-0,105175452			20,48

$$\lg a=\frac{\begin{vmatrix}\sum_{i=1}^{n}\lg\xi_i & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i\lg\xi_i & \sum_{i=1}^{n}t_i^2\end{vmatrix}}{\begin{vmatrix}n & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}t_i^2\end{vmatrix}}=\frac{\sum_{i=1}^{n}\lg\xi_i\sum_{i=1}^{n}t_i^2-\sum_{i=1}^{n}t_i\lg\xi_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i^2-\left(\sum_{i=1}^{n}t_i\right)^2}\frac{15{,}27551309\cdot 60}{9\cdot 60}=1{,}697279232$$

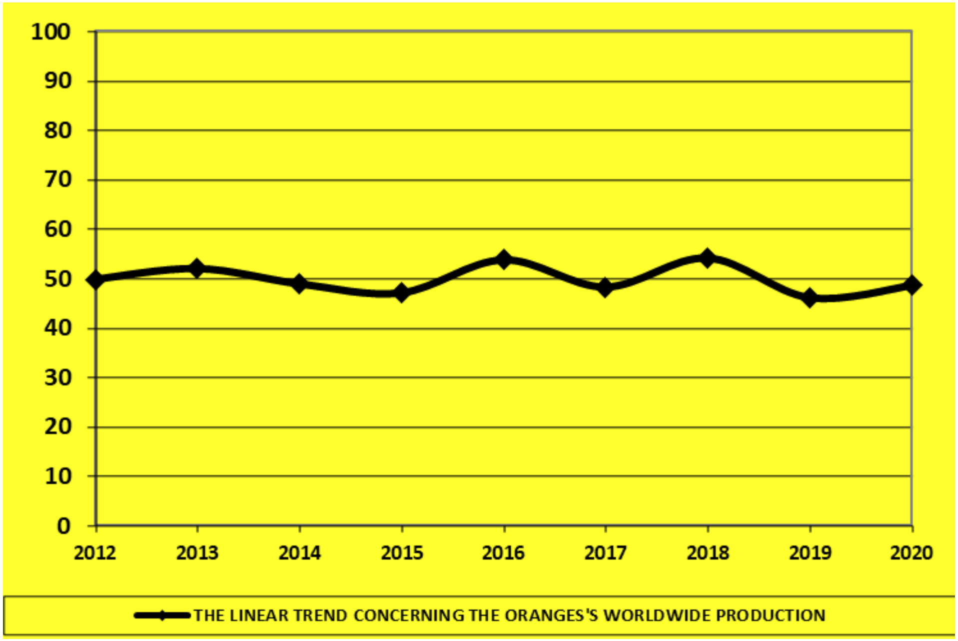
$$\lg b=\frac{\begin{vmatrix}n & \sum_{i=1}^{n}\lg\xi_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}t_i\lg\xi_i\end{vmatrix}}{\begin{vmatrix}n & \sum_{i=1}^{n}t_i\\ \sum_{i=1}^{n}t_i & \sum_{i=1}^{n}t_i^2\end{vmatrix}}=\frac{n\cdot\sum_{i=1}^{n}t_i\lg\xi_i-\sum_{i=1}^{n}\lg\xi_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i^2-\left(\sum_{i=1}^{n}t_i\right)^2}=\frac{9\cdot(-0{,}105175452)}{9\cdot 60}=-0{,}0017529242$$

$$v_{\exp}=\left[\frac{\sum_{i=1}^{n}\left|\xi_i-\xi_{t_i}^{\exp}\right|}{n}:\frac{\sum_{i=1}^{n}\xi_i}{n}\right]\cdot 100=\frac{\sum_{i=1}^{n}\left|\xi_i-\xi_{t_i}^{\exp}\right|}{\sum_{i=1}^{n}\xi_i}\cdot 100=\frac{20{,}48}{444{,}92}\cdot 100=4{,}60\%$$

$$v_I=4{,}18\%<v_{II}=4{,}31\%<v_{\exp}=4{,}60\%$$

The values regarding **the oranges' s worldwide production** cover a linear projection $\xi_{t_i}=a+b\cdot t_i$

$$\xi_{2021}^{ORANGE'S\_WORLDWIDE\_PRODUCTION}=49{,}43555556+(-0{,}19)\cdot 5=48{,}49\_millions\_tons$$
$$\xi_{2022}^{ORANGE'S\_WORLDWIDE\_PRODUCTION}=49{,}43555556+(-0{,}19)\cdot 6=48{,}30\_millions\_tons$$
$$\xi_{2023}^{ORANGE'S\_WORLDWIDE\_PRODUCTION}=49{,}43555556+(-0{,}19)\cdot 7=48{,}11\_millions\_tons$$
$$\xi_{2024}^{ORANGE'S\_WORLDWIDE\_PRODUCTION}=49{,}43555556+(-0{,}19)\cdot 8=47{,}92\_millions\_tons$$
$$\xi_{2025}^{ORANGE'S\_WORLDWIDE\_PRODUCTION}=49{,}43555556+(-0{,}19)\cdot 9=47{,}73\_millions\_tons$$



Graph 1 The linear projection for the values which show us the evolution regarding the oranges's worldwide production

3. The prognosis regarding the bananas's worldwide productions between 2021-2025

Table 5 The bananas's worldwide production, between 2010-2020

YEARS	THE BANANAS'S WORLDWIDE PRODUCTION (millions tons) (ω_i)	YEARS	THE BANANAS'S WORLDWIDE PRODUCTION (millions tons) (ω_i)
2010	**108,66**	**2016**	**110,70**
2011	**109,41**	**2017**	**112,24**
2012	**109,34**	**2018**	**115,77**
2013	**112,25**	**2019**	**116,68**
2014	**112,81**	**2020**	**117,81**
2015	**115,21**		

Source: „Statista Portal the United States of America"

- if the procedure's architecture, which suggests the trend for ω variable, where ω = **the banana's worldwide production**, focuses as target a linear model, $\omega_{t_i} = a + b \cdot t_i$, *a* and *b* will be [3]:

Table 6 The realm of the values concerning the bananas's worldwide production, if this makes a linear projection

YEARS	THE BANANAS'S WORLDWIDE PRODUCTION (millions tons) (ω_i)	LINEAR TENDENCY				
		t_i	t_i^2	$t_i\omega_i$	$\omega_{t_i} = a + bt_i$	$\lvert\omega_i - \omega_{t_i}\rvert$
2010	**108,66**	-5	25	-543,30	108,6259091	0,03
2011	**109,41**	-4	16	-437,64	109,4621818	0,05
2012	**109,34**	-3	9	-328,02	110,2984545	0,96
2013	**112,25**	-2	4	-224,50	111,1347272	1,12
2014	**112,81**	-1	1	-112,81	111,9710000	0,84
2015	**115,21**	0	0	0	112,8072727	2,40
2016	**110,70**	+1	1	+110,70	113,6435454	2,94
2017	**112,24**	+2	4	+224,48	114,4798182	2,24
2018	**115,77**	+3	9	+347,31	115,3160909	0,45
2019	**116,68**	+4	16	+466,72	116,1523636	0,53
2020	**117,81**	+5	25	+589,05	116,9886363	0,82
TOTAL	**1240,88**	0	110	91,99		12,38

$$a = \frac{\sum_{i=1}^{n}\omega_i \sum_{i=1}^{n} t_i^{\,2} - \sum_{i=1}^{n}\omega_i t_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^{\,2} - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{1240{,}88 \cdot 110}{11 \cdot 110} = 112{,}8072727 \qquad b = \frac{n\sum_{i=1}^{n}\omega_i t_i - \sum_{i=1}^{n} t_i \sum_{i=1}^{n}\omega_i}{n\sum_{i=1}^{n} t_i^{\,2} - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{11 \cdot 91{,}99}{11 \cdot 110} = 0{,}836272727$$

$$v_I = \left[\frac{\sum_{i=1}^{n}\left|\omega_i - \omega_{t_i}^I\right|}{n} : \frac{\sum_{i=1}^{n}\omega_i}{n}\right] \cdot 100 = \frac{\sum_{i=1}^{n}\left|\omega_i - \omega_{t_i}^I\right|}{\sum_{i=1}^{n}\omega_i} \cdot 100 = \frac{12{,}38}{1240{,}88} \cdot 100 = 0{,}9977\%$$

- if the procedure's architecture, which suggests the trend for ω variable, where ω = **the bananas's worldwide production**, focuses as target a quadratic model, $\omega_{t_i} = a + b \cdot t_i + ct_i^2$, *a* and *b* will be [3]:

Table 7 The realm of the values regarding the bananas's worldwide production, if this makes a quadratic projection

YEARS	THE BANANAS'S WORLDWIDE PRODUCTION (millions tons) (ω_i)	PARABOLIC TENDENCY					
		t_i	t_i^2	t_i^4	$t_i^2\omega_i$	$\omega_{t_i} = a + bt_i + ct_i^2$	$\lvert\omega_i - \omega_{t_i}\rvert$
2010	**108,66**	-5	25	625	2716,50	246,5687413	137,91
2011	**109,41**	-4	16	256	1750,56	164,6393147	55,23
2012	**109,34**	-3	9	81	8856,54	101,1022657	8,24
2013	**112,25**	-2	4	16	449,00	55,95759441	56,29
2014	**112,81**	-1	1	1	112,81	29,20530070	83,60
2015	**115,21**	0	0	0	0	20,84538462	94,36
2016	**110,70**	+1	1	1	110,70	30,87784616	79,82
2017	**112,24**	+2	4	16	448,96	59,30268532	52,94

YEARS	THE BANANAS'S WORLDWIDE PRODUCTION (millions tons) (ω_i)	PARABOLIC TENDENCY					
		t_i	t_i^2	t_i^4	$t_i^2\omega_i$	$\omega_{t_i} = a + bt_i + ct_i^2$	$\lvert\omega_i - \omega_{t_i}\rvert$
2018	**115,77**	+3	9	81	1041,93	106,1199021	9,56
2019	**116,68**	+4	16	256	1866,88	171,3294965	54,65
2020	**117,81**	+5	25	625	2945,25	254,9314685	137,12
TOTAL	**1240,88**	0	110	1958	20299,13	1240,88	769,72

$$a = \frac{\sum_{i=1}^{n} t_i^4 \sum_{i=1}^{n} \omega_i - \sum_{i=1}^{n} t_i^2 \sum_{i=1}^{n} t_i^2 \cdot \omega_i}{n\sum_{i=1}^{n} t_i^{\,4} - \left(\sum_{i=1}^{n} t_i^2\right)^2} = \frac{1958 \cdot 1240{,}88 - 110 \cdot 20299{,}13}{11 \cdot 1958 - 110^2} = 20{,}84538462$$

$$b = \frac{\sum_{i=1}^{n} \omega_i t_i}{\sum_{i=1}^{n} t_i^{\,2}} = \frac{91{,}99}{110} = 0{,}836272727$$

$$c = \frac{n \cdot \sum_{i=1}^{n} t_i^2 \cdot \omega_i - \sum_{i=1}^{n} t_i^2 \cdot \sum_{i=1}^{n} \omega_i}{n\sum_{i=1}^{n} t_i^{\,4} - \left(\sum_{i=1}^{n} t_i^2\right)^2} = \frac{11 \cdot 20299{,}13 - 110 \cdot 1240{,}88}{11 \cdot 1958 - 110^2} = 9{,}196188811$$

$$v_{II} = \left[\frac{\sum_{i=1}^{n} \left|\omega_i - \omega_{t_i}^{II}\right|}{n} : \frac{\sum_{i=1}^{n} \omega_i}{n}\right] \cdot 100 = \frac{\sum_{i=1}^{n} \left|\omega_i - \omega_{t_i}^{II}\right|}{\sum_{i=1}^{n} \omega_i} \cdot 100 = \frac{769{,}72}{1240{,}88} \cdot 100 = 62{,}03\%$$

- if the procedure's architecture, which suggests the trend for ω variable, where ω = **the bananas's worldwide production**, focuses as target an exponential model, $\omega_{t_i} = ab^{t_i}$, *a* and *b* will be [3]:

Table 8 The realm of the values regarding the bananas's worldwide production, if this makes an exponential projection

YEARS	THE BANANAS'S WORLDWIDE PRODUCTION (millions tons) (ω_i)	EXPONENTIAL TENDENCY					
		t_i	$\lg\omega_i$	$t_i \lg\omega_i$	$\lg\omega_{t_i} = \lg a + t_i \lg b$	$\omega_{t_i} = ab^{t_i}$	$\lvert\omega_i - \omega_{t_i}\rvert$
2010	**108,66**	-5	2,036069701	-10,18034850	2,036113917	108,6710634	0,01
2011	**109,41**	-4	2,039057018	-8,156228072	2,039327494	109,4781611	0,07
2012	**109,34**	-3	2,038779070	-6,116337209	2,042541070	110,2912528	0,95
2013	**112,25**	-2	2,050186350	-4,100372699	2,045754647	111,1103836	1,14
2014	**112,81**	-1	2,052347599	-2,052347599	2,048968223	111,9355978	0,87
2015	**115,21**	0	2,061490177	0	2,052181800	112,7669411	2,44
2016	**110,70**	+1	2,044147621	+2,044147621	2,055395377	113,6044588	2,90
2017	**112,24**	+2	2,050147658	+4,100295316	2,058608953	114,4481964	2,21
2018	**115,77**	+3	2,063596033	+6,190788100	2,061822530	115,2982007	0,47
2019	**116,68**	+4	2,066996420	+8,267985682	2,065036106	116,1545169	0,52
2020	**117,81**	+5	2,071182156	+10,35591078	2,068249683	117,0171949	0,79
TOTAL	**1240,88**	0	22,5739998	0,35349342			12,37

$$\lg a = \frac{\sum_{i=1}^{n} \lg\omega_i \sum_{i=1}^{n} t_i^{\,2} - \sum_{i=1}^{n} t_i \lg\omega_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^{\,2} - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{22{,}5739998 \cdot 110}{11 \cdot 110} = 2{,}0521818$$

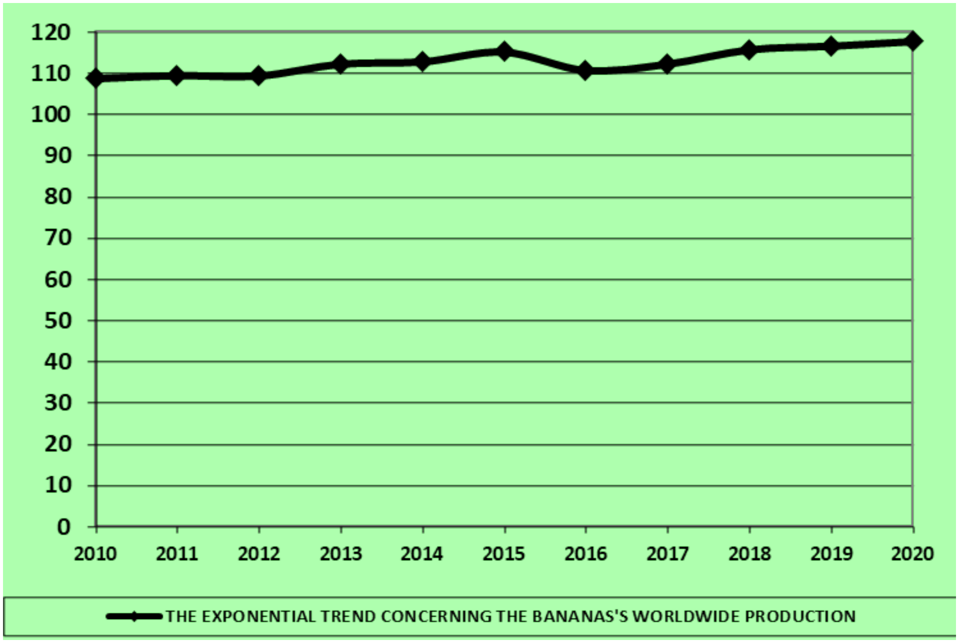
$$\lg b = \frac{n \cdot \sum_{i=1}^{n} t_i \lg\omega_i - \sum_{i=1}^{n} \lg\omega_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^{\,2} - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{11 \cdot (0{,}35349342)}{11 \cdot 110} = 0{,}003213576545$$

$$v_{\exp} = \left[\frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{t_i}^{\exp} \right|}{n} : \frac{\sum_{i=1}^{n} \omega_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left| \omega_i - \omega_{t_i}^{\exp} \right|}{\sum_{i=1}^{n} \omega_i} \cdot 100 = \frac{12,37}{1240,88} \cdot 100 = 0,9969\%$$

$$v_{\exp} = 0,9969\% < v_I = 0,9977\% < v_{II} = 62,03\%$$

The values concerning **the bananas's worldwide production** cover an exponential projection $\omega_{t_i} = ab^{t_i}$

$$\omega_{2021}^{BANANAS'S\_WORLDWIDE\_PRODUCTION} = 112,7669411 \cdot (1,007426978)^6 = 117,89\_millions\_tons$$
$$\omega_{2022}^{BANANAS'S\_WORLDWIDE\_PRODUCTION} = 112,7669411 \cdot (1,007426978)^7 = 118,76\_millions\_tons$$
$$\omega_{2023}^{BANANAS'S\_WORLDWIDE\_PRODUCTION} = 112,7669411 \cdot (1,007426978)^8 = 119,64\_millions\_tons$$
$$\omega_{2024}^{BANANAS'S\_WORLDWIDE\_PRODUCTION} = 112,7669411 \cdot (1,007426978)^9 = 120,53\_millions\_tons$$
$$\omega_{2025}^{BANANAS'S\_WORLDWIDE\_PRODUCTION} = 112,7669411 \cdot (1,007426978)^{10} = 121,43\_millions\_tons$$



Graph 2 The exponential projection for the values which show us the evolution regarding the bananas's worldwide production

4. The prognosis concerning the lemons's worldwide productions between 2021-2025

Table 9 The lemons's worldwide production between 2010-2020

YEARS	THE LEMONS'S WORLDWIDE PRODUCTION (milions tons) (λ_i)
2010	14,85
2011	15,07
2012	15,01
2013	15,23
2014	16,25
2015	16,91
2016	17,23
2017	17,45
2018	19,58
2019	20,05
2020	21,89

Source: „Statista Portal the United States of America"

- if the procedure's architecture, which suggests the trend for λ variable, where λ = **the lemons's worldwide production**, focuses as target a linear model, $\lambda_{t_i} = a + b \cdot t_i$, *a* and *b* will be [3]:

Table 10 The realm of the values concerning the lemons's worldwide production, if this makes a linear projection

YEARS	THE LEMONS'S WORLDWIDE PRODUCTION (millions tons) (λ_i)	LINEAR TENDENCY				
		t_i	t_i^2	$t_i\lambda_i$	$\lambda_{t_i} = a + bt_i$	$\lvert\lambda_i - \lambda_{t_i}\rvert$
2010	**14,85**	-5	25	-74,25	13,85409091	1,00
2011	**15,07**	-4	16	-60,28	14,52909091	0,54
2012	**15,01**	-3	9	-45,03	15,20409091	0,19
2013	**15,23**	-2	4	-30,46	15,87909091	0,65
2014	**16,25**	-1	1	-16,25	16,55409091	0,30
2015	**16,91**	0	0	0	17,22909091	0,32
2016	**17,23**	+1	1	+17,23	17,90409091	0,67
2017	**17,45**	+2	4	+34,90	18,57909091	1,13
2018	**19,58**	+3	9	+58,74	19,25409091	0,33
2019	**20,05**	+4	16	+80,20	19,92909091	0,12
2020	**21,89**	+5	25	+109,45	20,60409091	1,29
TOTAL	**189,52**	0	110	74,25		6,54

$$a = \frac{\sum_{i=1}^{n}\lambda_i \sum_{i=1}^{n} t_i^{\,2} - \sum_{i=1}^{n}\lambda_i t_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^{\,2} - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{189{,}52 \cdot 110}{11 \cdot 110} = 17{,}22909091 \quad b = \frac{n\sum_{i=1}^{n}\lambda_i t_i - \sum_{i=1}^{n} t_i \sum_{i=1}^{n}\lambda_i}{n\sum_{i=1}^{n} t_i^{\,2} - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{11 \cdot 74{,}25}{11 \cdot 110} = 0{,}675$$

$$v_I = \left[\frac{\sum_{i=1}^{n}\left|\lambda_i - \lambda_{t_i}^I\right|}{n} : \frac{\sum_{i=1}^{n}\omega_i}{n}\right] \cdot 100 = \frac{\sum_{i=1}^{n}\left|\lambda_i - \lambda_{t_i}^I\right|}{\sum_{i=1}^{n}\lambda_i} \cdot 100 = \frac{6{,}54}{189{,}52} \cdot 100 = 3{,}45\%$$

- if the procedure's architecture, which suggests the trend for λ variable, where λ = **the lemons's worldwide production**, focuses as target a quadratic model, $\lambda_{t_i} = a + b \cdot t_i + ct_i^2$, *a* and *b* will be [3]:

Table 11 The realm of the values regarding the lemons's worldwide production, if this makes a quadratic projection

YEARS	THE LEMONS'S WORLDWIDE PRODUCTION (millions tons) (λ_i)	PARABOLIC TENDENCY					
		t_i	t_i^2	t_i^4	$t_i^2\lambda_i$	$\lambda_{t_i} = a + bt_i + ct_i^2$	$\lvert\lambda_i - \lambda_{t_i}\rvert$
2010	**14,85**	-5	25	625	371,25	14,91580418	0,07
2011	**15,07**	-4	16	256	241,12	14,95377621	0,12
2012	**15,01**	-3	9	81	135,09	15,13331002	0,12
2013	**15,23**	-2	4	16	60,92	15,45440559	0,22
2014	**16,25**	-1	1	1	16,25	15,91706294	0,33
2015	**16,91**	0	0	0	0	16,52128205	0,39
2016	**17,23**	+1	1	1	17,23	17,26706294	0,04
2017	**17,45**	+2	4	16	69,80	18,15440559	0,70
2018	**19,58**	+3	9	81	176,22	19,18331002	0,40
2019	**20,05**	+4	16	256	320,80	20,35377621	0,30
2020	**21,89**	+5	25	625	547,25	21,66580418	0,22
TOTAL	**189,52**	0	110	1958	1955,93		2,91

$$a = \frac{\sum_{i=1}^{n} t_i^4 \sum_{i=1}^{n}\lambda_i - \sum_{i=1}^{n} t_i^2 \sum_{i=1}^{n} t_i^2 \cdot \lambda_i}{n\sum_{i=1}^{n} t_i^{\,4} - \left(\sum_{i=1}^{n} t_i^2\right)^2} = \frac{1958 \cdot 189{,}52 - 110 \cdot 1955{,}93}{11 \cdot 1958 - 110^2} = 16{,}52128205 \quad b = \frac{\sum_{i=1}^{n}\lambda_i t_i}{\sum_{i=1}^{n} t_i^{\,2}} = \frac{74{,}25}{110} = 0{,}675$$

$$c = \frac{n \cdot \sum_{i=1}^{n} t_i^2 \cdot \lambda_i - \sum_{i=1}^{n} t_i^2 \cdot \sum_{i=1}^{n}\lambda_i}{n\sum_{i=1}^{n} t_i^4 - \left(\sum_{i=1}^{n} t_i^2\right)^2} = \frac{11 \cdot 1955{,}93 - 110 \cdot 189{,}52}{11 \cdot 1958 - 110^2} = 0{,}070780885$$

$$v_{II} = \left[\frac{\sum_{i=1}^{n} \left| \lambda_i - \lambda_{t_i}^{II} \right|}{n} : \frac{\sum_{i=1}^{n} \lambda_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left| \lambda_i - \lambda_{t_i}^{II} \right|}{\sum_{i=1}^{n} \lambda_i} \cdot 100 = \frac{2{,}91}{189{,}52} \cdot 100 = 1{,}53\%$$

- if the procedure's architecture, which suggests the trend for λ variable, where λ = **the lemons's worldwide production**, focuses as target an exponential model, $\lambda_{t_i} = ab^{t_i}$, *a* and *b* will be [3]:

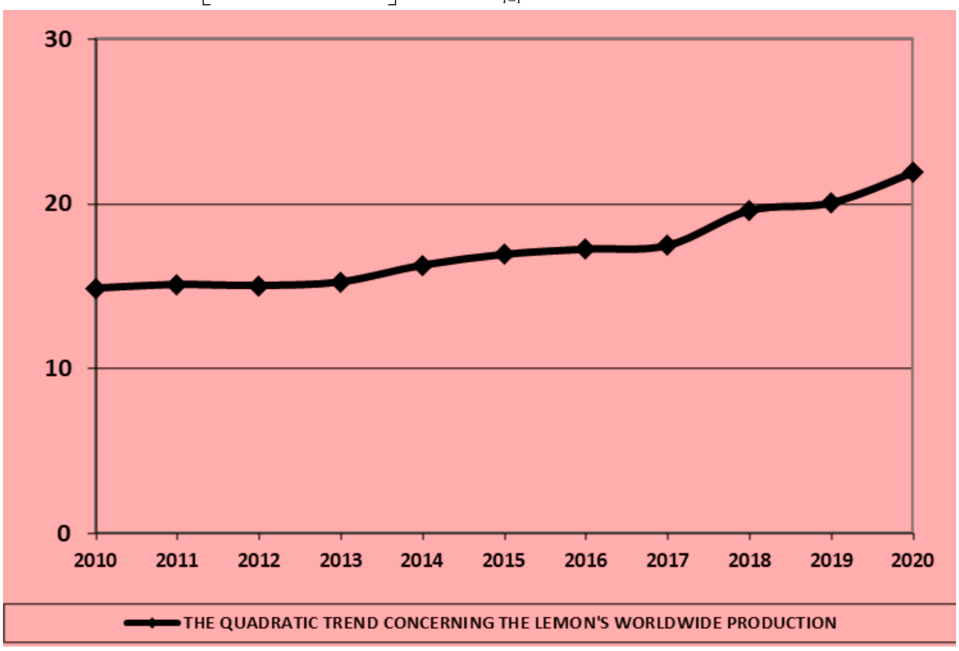
Table 12 The realm of the values regarding the lemons's worldwide production, if this makes an exponential projection

YEARS	THE LEMONS'S WORLDWIDE PRODUCTION (millions tons) (λ_i)	EXPONENTIAL TENDENCY					
		t_i	$\lg \lambda_i$	$t_i \lg \lambda_i$	$\lg \lambda_{t_i} = \lg a + t_i \lg b$	$\lambda_{t_i} = ab^{t_i}$	$\left\| \lambda_i - \lambda_{t_i} \right\|$
2010	**14,85**	-5	1,171726454	-5,858652268	1,208201814	16,15108914	1,30
2011	**15,07**	-4	1,178113252	-4,712453009	1,224824541	16,78125903	1,71
2012	**15,01**	-3	1,176380692	-3,529142077	1,241447268	17,43601637	2,43
2013	**15,23**	-2	1,182699903	-2,365399807	1,258069995	18,11632049	2,89
2014	**16,25**	-1	1,210853365	-1,210853365	1,274692722	18,82316816	2,57
2015	**16,91**	0	1,228143608	0	1,291315449	19,55759502	2,65
2016	**17,23**	+1	1,236285277	+1,236285277	1,307938176	20,32067715	3,09
2017	**17,45**	+2	1,241795431	+2,483590863	1,324560903	21,11353259	3,66
2018	**19,58**	+3	1,291812687	+3,875438062	1,341183630	21,93732301	2,36
2019	**20,05**	+4	1,302114377	+5,208457508	1,357806357	22,79325541	2,74
2020	**21,89**	+5	1,340245762	+6,701228808	1,374429084	23,68258387	1,79
TOTAL	**189,52**	0	14,20446994	1,828499992			27,19

$$\lg a = \frac{\sum_{i=1}^{n} \lg \lambda_i \sum_{i=1}^{n} t_i^2 - \sum_{i=1}^{n} t_i \lg \lambda_i \sum_{i=1}^{n} t_i}{n \sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i \right)^2} = \frac{14{,}20446994 \cdot 110}{11 \cdot 110} = 1{,}291315449$$

$$\lg b = \frac{n \cdot \sum_{i=1}^{n} t_i \lg \lambda_i - \sum_{i=1}^{n} \lg \lambda_i \sum_{i=1}^{n} t_i}{n \sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i \right)^2} = \frac{11 \cdot 1{,}828499992}{11 \cdot 110} = 0{,}016622727$$

$$v_{\exp} = \left[\frac{\sum_{i=1}^{n} \left| \lambda_i - \lambda_{t_i}^{\exp} \right|}{n} : \frac{\sum_{i=1}^{n} \lambda_i}{n} \right] \cdot 100 = \frac{\sum_{i=1}^{n} \left| \lambda_i - \lambda_{t_i}^{\exp} \right|}{\sum_{i=1}^{n} \lambda_i} \cdot 100 = \frac{27{,}19}{189{,}52} \cdot 100 = 14{,}35\%$$



Graph 3 The quadratic projection for the values which show us the evolution for the lemons's worldwide production

$$v_{II} = 1{,}53\% < v_I = 3{,}45\% < v_{\exp} = 14{,}35\%$$

The values concerning **the lemon's worldwide production** cover a quadratic projection $\lambda_{t_i} = a + b \cdot t_i + ct_i^2$

$$\lambda_{2021}^{LEMONS'S\_WORLDWIDE\_PRODUCTION} = 16{,}52128205 + 0{,}675 \cdot 6 + 0{,}070780885 \cdot 6^2 = 23{,}12\_millions\_tons$$
$$\lambda_{2022}^{LEMONS'S\_WORLDWIDE\_PRODUCTION} = 16{,}52128205 + 0{,}675 \cdot 7 + 0{,}070780885 \cdot 7^2 = 24{,}71\_millions\_tons$$
$$\lambda_{2023}^{LEMONS'S\_WORLDWIDE\_PRODUCTION} = 16{,}52128205 + 0{,}675 \cdot 8 + 0{,}070780885 \cdot 8^2 = 26{,}45\_millions\_tons$$
$$\lambda_{2024}^{LEMONS'S\_WORLDWIDE\_PRODUCTION} = 16{,}52128205 + 0{,}675 \cdot 9 + 0{,}070780885 \cdot 9^2 = 28{,}33\_millions\_tons$$
$$\lambda_{2025}^{LEMONS'S\_WORLDWIDE\_PRODUCTION} = 16{,}52128205 + 0{,}675 \cdot 10 + 0{,}070780885 \cdot 10^2 = 30{,}35\_millions\_tons$$

5. The prognosis regarding the mango's worldwide production between 2021-2025

Table 13 The mango's worldwide production between 2010-2020

YEARS	THE MANGO'S WORLDWIDE PRODUCTION (millions tons) (γ_i)
2010	**37,40**
2011	**39,26**
2012	**40,44**
2013	**42,66**
2014	**45,22**
2015	**48,07**
2016	**49,52**
2017	**52,00**
2018	**53,41**
2019	**55,85**
2020	**58,10**

Source: „Statista Portal the United States of America"

- if the procedure's architecture, which suggests the trend for γ variable, where γ = **the mango's worldwide production**, focuses as target a linear model, $\gamma_{t_i} = a + b \cdot t_i$, *a* and *b* will be [3]:

Table 14 The realm of the values concerning the mango's worldwide production, if this makes a linear projection

YEARS	THE MANGO'S WORLDWIDE PRODUCTION (millions tons) (γ_i)	LINEAR TENDENCY				
		t_i	t_i^2	$t_i\gamma_i$	$\gamma_{t_i} = a + bt_i$	$\lvert\gamma_i - \gamma_{t_i}\rvert$
2010	**37,40**	-5	25	-187,00	36,91409091	0,49
2011	**39,26**	-4	16	-157,04	39,02090909	0,24
2012	**40,44**	-3	9	-121,32	41,12772727	0,69
2013	**42,66**	-2	4	-85,32	43,23454546	0,57
2014	**45,22**	-1	1	-45,22	45,34136364	3,12
2015	**48,07**	0	0	0	47,44818182	0,62
2016	**49,52**	+1	1	+49,52	49,55500000	0,03
2017	**52,00**	+2	4	+104,00	51,66181818	0,34
2018	**53,41**	+3	9	+160,23	53,76863637	0,36
2019	**55,85**	+4	16	+223,40	55,87545455	0,02
2020	**58,10**	+5	25	+290,50	57,98227273	0,12
TOTAL	**521,93**	0	110	231,75		6,60

$$a = \frac{\sum_{i=1}^{n}\gamma_i \sum_{i=1}^{n} t_i^2 - \sum_{i=1}^{n}\gamma_i t_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{521{,}93 \cdot 110}{11 \cdot 110} = 47{,}44818182 \quad b = \frac{n\sum_{i=1}^{n}\gamma_i t_i - \sum_{i=1}^{n} t_i \sum_{i=1}^{n}\gamma_i}{n\sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{11 \cdot 231{,}75}{11 \cdot 110} = 2{,}106818182$$

$$v_I = \left[\frac{\sum_{i=1}^{n}\left|\gamma_i - \gamma_{t_i}^I\right|}{n} : \frac{\sum_{i=1}^{n}\gamma_i}{n}\right] \cdot 100 = \frac{\sum_{i=1}^{n}\left|\gamma_i - \gamma_{t_i}^I\right|}{\sum_{i=1}^{n}\gamma_i} \cdot 100 = \frac{6{,}60}{521{,}93} \cdot 100 = 1{,}27\%$$

- if the procedure's architecture, which suggests the trend for γ variable, where γ = **the mango's worldwide production**, focuses as target a quadratic model, $\gamma_{t_i} = a + b \cdot t_i + ct_i^2$, *a* and *b* will be [3]:

Table 15 The realm of the values regarding the mango's worldwide production, if this makes a quadratic projection

YEARS	THE MANGO'S WORLDWIDE PRODUCTION (milllions tons) (γ_i)	PARABOLIC TENDENCY					
		t_i	t_i^2	t_i^4	$t_i^2\gamma_i$	$\gamma_{t_i} = a + bt_i + ct_i^2$	$\lvert\gamma_i - \gamma_{t_i}\rvert$
2010	**37,40**	-5	25	625	935,00	37,05377623	0,35
2011	**39,26**	-4	16	256	628,16	39,07678322	0,18
2012	**40,44**	-3	9	81	363,96	41,11886247	0,68
2013	**42,66**	-2	4	16	170,64	43,17867133	0,52
2014	**45,22**	-1	1	1	45,22	45,25755245	0,04
2015	**48,07**	0	0	0	0	47,35505828	0,72
2016	**49,52**	+1	1	1	49,52	49,47118882	0,05
2017	**52,00**	+2	4	16	208,00	51,60594406	0,39
2018	**53,41**	+3	9	81	480,69	53,75932401	0,35
2019	**55,85**	+4	16	256	893,60	55,93132868	0,08
2020	**58,10**	+5	25	625	1452,50	58,12195805	0,02
TOTAL	**521,93**	0	110	1958	5227,29		3,38

$$a = \frac{\sum_{i=1}^{n} t_i^4 \sum_{i=1}^{n} \gamma_i - \sum_{i=1}^{n} t_i^2 \sum_{i=1}^{n} t_i^2 \cdot \gamma_i}{n\sum_{i=1}^{n} t_i^4 - \left(\sum_{i=1}^{n} t_i^2\right)^2} = \frac{1958 \cdot 521{,}93 - 110 \cdot 5227{,}29}{11 \cdot 1958 - 110^2} = 47{,}35505828$$

$$b = \frac{\sum_{i=1}^{n} \gamma_i t_i}{\sum_{i=1}^{n} t_i^2} = \frac{231{,}75}{110} = 2{,}106818182$$

$$c = \frac{n \cdot \sum_{i=1}^{n} t_i^2 \cdot \gamma_i - \sum_{i=1}^{n} t_i^2 \cdot \sum_{i=1}^{n} \gamma_i}{n\sum_{i=1}^{n} t_i^4 - \left(\sum_{i=1}^{n} t_i^2\right)^2} = \frac{11 \cdot 5227{,}29 - 110 \cdot 521{,}93}{11 \cdot 1958 - 110^2} = 0{,}009312354312$$

$$v_{II} = \left[\frac{\sum_{i=1}^{n} \left|\gamma_i - \gamma_{t_i}^{II}\right|}{n} : \frac{\sum_{i=1}^{n} \gamma_i}{n}\right] \cdot 100 = \frac{\sum_{i=1}^{n} \left|\gamma_i - \gamma_{t_i}^{II}\right|}{\sum_{i=1}^{n} \gamma_i} \cdot 100 = \frac{3{,}38}{521{,}93} \cdot 100 = 0{,}65\%$$

- if the procedure's architecture, which suggests the trend for γ variable, where γ = **the mango's worldwide production**, focuses as target an exponential model, $\gamma_{t_i} = ab^{t_i}$, *a* and *b* will be [3]:

Table 16 The realm of the values regarding the mango's worldwide production, if this makes an exponential projection

YEARS	THE MANGO'S WORLDWIDE PRODUCTION (millions tons) (γ_i)	EXPONENTIAL TENDENCY					
		t_i	$\lg\gamma_i$	$t_i \lg\gamma_i$	$\lg\gamma_{t_i} = \lg a + t_i \lg b$	$\gamma_{t_i} = ab^{t_i}$	$\lvert\gamma_i - \gamma_{t_i}\rvert$
2010	**37,40**	-5	1,572871602	-7,864358011	1,574466609	37,53760923	0,14
2011	**39,26**	-4	1,593950295	-6,375801181	1,593945368	39,25955458	0,04
2012	**40,44**	-3	1,606811147	-4,820433441	1,613424127	41,06048993	0,62
2013	**42,66**	-2	1,630020851	-3,260041702	1,632902886	42,94403875	0,28
2014	**45,22**	-1	1,655330558	-1,655330558	1,652381645	44,91399073	0,31
2015	**48,07**	0	1,681874122	0	1,671860404	46,97430940	1,10
2016	**49,52**	+1	1,694780636	+1,694780636	1,691339163	49,12914012	0,39
2017	**52,00**	+2	1,716003344	+3,432006687	1,710817922	51,38281839	0,62
2018	**53,41**	+3	1,727622578	+5,182867734	1,730296681	53,73987860	0,33
2019	**55,85**	+4	1,747023177	+6,988092710	1,749775440	56,20506314	0,35
2020	**58,10**	+5	1,764176132	+8,820880662	1,769254199	58,78333194	0,68
TOTAL	**521,93**	0	18,39046444	2,142663536			4,86

$$\lg a = \frac{\sum_{i=1}^{n}\lg\gamma_i \sum_{i=1}^{n}t_i^2 - \sum_{i=1}^{n}t_i\lg\gamma_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i^2 - \left(\sum_{i=1}^{n}t_i\right)^2} = \frac{18,39046444\cdot 110}{11\cdot 110} = 1,671860404$$

$$\lg b = \frac{n\cdot\sum_{i=1}^{n}t_i\lg\gamma_i - \sum_{i=1}^{n}\lg\lambda_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i^2 - \left(\sum_{i=1}^{n}t_i\right)^2} = \frac{11\cdot 2,142663536}{11\cdot 110} = 0,019478759$$

$$v_{\exp} = \left[\frac{\sum_{i=1}^{n}\left|\gamma_i - \gamma_{t_i}^{\exp}\right|}{n} : \frac{\sum_{i=1}^{n}\gamma_i}{n}\right]\cdot 100 = \frac{\sum_{i=1}^{n}\left|\gamma_i - \gamma_{t_i}^{\exp}\right|}{\sum_{i=1}^{n}\gamma_i}\cdot 100 = \frac{4,86}{521,93}\cdot 100 = 0,93\%$$

$$v_{II} = 0,65\% < v_{\exp} = 0,93\% < v_I = 1,27\%$$

The values concerning **the mango's worldwide production** cover a quadratic projection $\gamma_{t_i} = a + b\cdot t_i + ct_i^2$

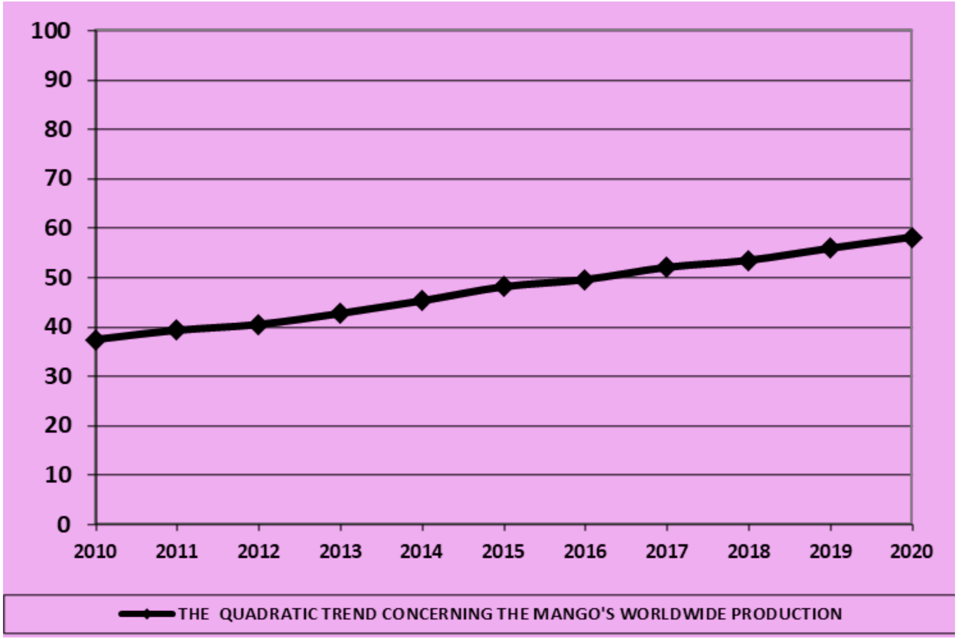
$$\gamma_{2021}^{MANGO'S\_WORLDWIDE\_PRODUCTION} = 47,35505828 + 2,106818182\cdot 6 + \cdot 0,009312354312\cdot 6^2 = 60,33\_millions\_tons$$

$$\gamma_{2022}^{MANGO'S\_WORLDWIDE\_PRODUCTION} = 47,35505828 + 2,106818182\cdot 7 + \cdot 0,009312354312\cdot 7^2 = 62,56\_millions\_tons$$

$$\gamma_{2023}^{MANGO'S\_WORLDWIDE\_PRODUCTION} = 47,35505828 + 2,106818182\cdot 8 + \cdot 0,009312354312\cdot 8^2 = 64,81\_millions\_tons$$

$$\gamma_{2024}^{MANGO'S\_WORLDWIDE\_PRODUCTION} = 47,35505828 + 2,106818182\cdot 9 + \cdot 0,009312354312\cdot 9^2 = 67,07\_millions\_tons$$

$$\gamma_{2025}^{MANGO'S\_WORLDWIDE\_PRODUCTION} = 47,35505828 + 2,106818182\cdot 10 + \cdot 0,009312354312\cdot 10^2 = 69,35\_millions\_tons$$



Graph 4 The quadratic projection for the values which show us the evolution concerning the mango's worldwide production

6. The prognosis concerning the papaya's worldwide production between 2021-2025

Table 17 The papaya's worldwide production between 2010-2020

YEARS	THE PAPAYA'S WORLDWIDE PRODUCTION (millions tons) (μ_i)
2010	11,90
2011	11,30
2012	12,01
2013	12,36
2014	12,67
2015	12,16
2016	12,96
2017	12,97
2018	13,24
2019	13,74
2020	13,95

Source: „Statista Portal the United States of America"

- if the procedure's architecture, which suggests the trend for μ variable, where μ = **the papaya's worldwide production**, focuses as target a linear model, $\mu_{t_i} = a + b \cdot t_i$, *a* and *b* will be [3]:

Table 18 The realm of the values concerning the papaya's worldwide production, if this makes a linear projection

YEARS	THE PAPAYA'S WORLDWIDE PRODUCTION (millions tons) (μ_i)	LINEAR TENDENCY				
		t_i	t_i^2	$t_i\mu_i$	$\mu_{t_i} = a + bt_i$	$\lvert \mu_i - \mu_{t_i} \rvert$
2010	**11,90**	-5	25	-59,50	11,51409091	0,39
2011	**11,30**	-4	16	-45,20	11,74327273	0,44
2012	**12,01**	-3	9	-36,03	11,97245455	0,04
2013	**12,36**	-2	4	-24,72	12,20163636	0,16
2014	**12,67**	-1	1	-12,67	12,43081818	0,24
2015	**12,16**	0	0	0	12,66000000	0,50
2016	**12,96**	+1	1	12,96	12,88918182	0,07
2017	**12,97**	+2	4	25,94	13,11836364	0,15
2018	**13,24**	+3	9	39,72	13,34754545	0,11
2019	**13,74**	+4	16	54,96	13,57672727	0,16
2020	**13,95**	+5	25	69,75	13,80590909	0,14
TOTAL	**139,26**	0	110	25,21		2,40

$$a = \frac{\sum_{i=1}^{n}\mu_i \sum_{i=1}^{n} t_i^{\ 2} - \sum_{i=1}^{n}\mu_i t_i \sum_{i=1}^{n} t_i}{n\sum_{i=1}^{n} t_i^{\ 2} - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{139{,}26 \cdot 110}{11 \cdot 110} = 12{,}66 \qquad b = \frac{n\sum_{i=1}^{n}\mu_i t_i - \sum_{i=1}^{n} t_i \sum_{i=1}^{n}\mu_i}{n\sum_{i=1}^{n} t_i^{\ 2} - \left(\sum_{i=1}^{n} t_i\right)^2} = \frac{11 \cdot 25{,}21}{11 \cdot 110} = 0{,}229181818$$

$$v_I = \left[\frac{\sum_{i=1}^{n}\left|\mu_i - \mu_{t_i}^{I}\right|}{n} : \frac{\sum_{i=1}^{n}\mu_i}{n}\right] \cdot 100 = \frac{\sum_{i=1}^{n}\left|\mu_i - \mu_{t_i}^{I}\right|}{\sum_{i=1}^{n}\gamma_i} \cdot 100 = \frac{2{,}40}{139{,}26} \cdot 100 = 1{,}72\%$$

- if the procedure's architecture, which suggests the trend for μ variable, where μ = **the papaya's worldwide production**, focuses as target a quadratic model, $\mu_{t_i} = a + b \cdot t_i + ct_i^2$, *a* and *b* will be [3]:

Table 19 The realm of the values regarding the papaya's worldwide production, if this makes a quadratic projection

YEARS	THE PAPAYA'S WORLDWIDE PRODUCTION (millions tons) (μ_i)	PARABOLIC TENDENCY				
		t_i	t_i^2	t_i^4	$t_i^2\mu_i$	$\mu_{t_i} = a + bt_i + ct_i^2$	$\lvert \mu_i - \mu_{t_i} \rvert$
2010	**11,90**	-5	25	625	297,50	13,28279720	1,38
2011	**11,30**	-4	16	256	180,80	12,45075523	1,15
2012	**12,01**	-3	9	81	108,09	11,85454078	0,16
2013	**12,36**	-2	4	16	49,44	11,49415384	0,87
2014	**12,67**	-1	1	1	12,67	11,36959440	1,30
2015	**12,16**	0	0	0	0	11,48086247	0,68
2016	**12,96**	+1	1	1	12,96	11,82795804	1,13
2017	**12,97**	+2	4	16	51,88	12,41098111	0,56
2018	**13,24**	+3	9	81	211,84	13,22963169	0,01
2019	**13,74**	+4	16	256	219,84	14,28420977	0,54
2020	**13,95**	+5	25	625	348,75	15,57461536	1,63
TOTAL	**139,26**	0	110	1958	1493,77		9,41

$$a = \frac{\sum_{i=1}^{n} t_i^4 \sum_{i=1}^{n}\mu_i - \sum_{i=1}^{n} t_i^2 \sum_{i=1}^{n} t_i^2 \cdot \mu_i}{n\sum_{i=1}^{n} t_i^{\ 4} - \left(\sum_{i=1}^{n} t_i^2\right)^2} = \frac{1958 \cdot 139{,}26 - 110 \cdot 1493{,}77}{11 \cdot 1958 - 110^2} = 11{,}48086247 \qquad b = \frac{\sum_{i=1}^{n}\mu_i t_i}{\sum_{i=1}^{n} t_i^{\ 2}} = \frac{25{,}21}{110} = 0{,}229181818$$

$$c=\frac{n\cdot\sum_{i=1}^{n}t_i^2\cdot\mu_i-\sum_{i=1}^{n}t_i^2\cdot\sum_{i=1}^{n}\mu_i}{n\sum_{i=1}^{n}t_i^4-\left(\sum_{i=1}^{n}t_i^2\right)^2}=\frac{11\cdot 1493{,}77-110\cdot 139{,}26}{11\cdot 1958-110^2}=0{,}117913752$$

$$v_{II}=\left[\frac{\sum_{i=1}^{n}\left|\mu_i-\mu_{t_i}^{II}\right|}{n}:\frac{\sum_{i=1}^{n}\mu_i}{n}\right]\cdot 100=\frac{\sum_{i=1}^{n}\left|\mu_i-\mu_{t_i}^{II}\right|}{\sum_{i=1}^{n}\mu_i}\cdot 100=\frac{9{,}41}{139{,}26}\cdot 100=6{,}76\%$$

- if the procedure's architecture, which suggests the trend for μ variable, where μ = **the papaya's worldwide production**, focuses as target an exponential model, $\mu_{t_i}=ab^{t_i}$, *a* and *b* will be [3]:

Table 20 The realm of the values regarding the papaya's worldwide production, if this makes an exponential projection

YEARS	THE PAPAYA'S WORLDWIDE PRODUCTION (millions tons) (μ_i)	EXPONENTIAL TENDENCY					
		t_i	$\lg\mu_i$	$t_i\ \lg\mu_i$	$\lg\mu_{t_i}=\lg a+t_i\lg b$	$\mu_{t_i}=ab^{t_i}$	$\left\|\mu_i-\mu_{t_i}\right\|$
2010	**11,90**	-5	1,075546961	-5,377734807	1,062377556	11,54456454	0,36
2011	**11,30**	-4	1,053078443	-4,212313774	1,070227335	11,75512726	0,45
2012	**12,01**	-3	1,079543007	-3,238629022	1,078077114	11,96953045	0,04
2013	**12,36**	-2	1,092018471	-2,184036942	1,085926893	12,18784417	0,17
2014	**12,67**	-1	1,102776615	-1,102776615	1,093776673	12,41013978	0,26
2015	**12,16**	0	1,084933575	0	1,101626452	12,63648982	0,47
2016	**12,96**	+1	1,112605002	+1,112605002	1,109476231	12,86696830	0,09
2017	**12,97**	+2	1,112939976	+2,225879952	1,117326011	13,10165053	0,13
2018	**13,24**	+3	1,121887985	+3,365663955	1,125175790	13,34061313	0,10
2019	**13,74**	+4	1,137986733	+4,551946931	1,133025569	13,58393419	0,16
2020	**13,95**	+5	1,144574208	+5,722871038	1,140875348	13,83169322	0,12
TOTAL	**139,26**	0	12,11789098	0,863475718			2,35

$$\lg a=\frac{\sum_{i=1}^{n}\lg\mu_i\sum_{i=1}^{n}t_i^2-\sum_{i=1}^{n}t_i\lg\mu_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i^2-\left(\sum_{i=1}^{n}t_i\right)^2}=\frac{12{,}11789098\cdot 110}{11\cdot 110}=1{,}101626452$$

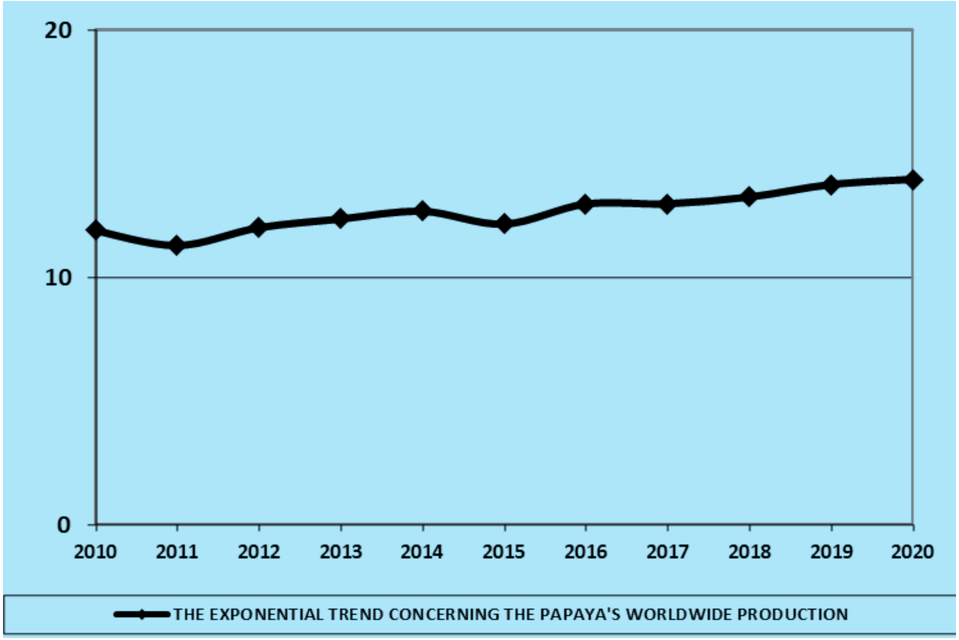
$$\lg b=\frac{n\cdot\sum_{i=1}^{n}t_i\lg\mu_i-\sum_{i=1}^{n}\lg\mu_i\sum_{i=1}^{n}t_i}{n\sum_{i=1}^{n}t_i^2-\left(\sum_{i=1}^{n}t_i\right)^2}=\frac{11\cdot 0{,}863475718}{11\cdot 110}=0{,}007849779255$$

$$v_{\exp}=\left[\frac{\sum_{i=1}^{n}\left|\mu_i-\mu_{t_i}^{\exp}\right|}{n}:\frac{\sum_{i=1}^{n}\mu_i}{n}\right]\cdot 100=\frac{\sum_{i=1}^{n}\left|\mu_i-\mu_{t_i}^{\exp}\right|}{\sum_{i=1}^{n}\mu_i}\cdot 100=\frac{2{,}35}{139{,}26}\cdot 100=1{,}69\%$$

$$v_{\exp}=1{,}69\%<v_I=1{,}72<v_{II}=6{,}76\%$$

The values concerning **the papaya's worldwide production** cover an exponential projection $\mu_{t_i}=ab^{t_i}$

$$\gamma_{2021}^{PAPAYA'S\_WORLDWIDE\_PRODUCTION}=12{,}63648982\cdot 1{,}018239^{6}=14{,}08\_millions\_tons$$
$$\gamma_{2022}^{PAPAYA'S\_WORLDWIDE\_PRODUCTION}=12{,}63648982\cdot 1{,}018239^{7}=14{,}34\_millions\_tons$$
$$\gamma_{2023}^{PAPAYA'S\_WORLDWIDE\_PRODUCTION}=12{,}63648982\cdot 1{,}018239^{8}=14{,}60\_millions\_tons$$
$$\gamma_{2024}^{PAPAYA'S\_WORLDWIDE\_PRODUCTION}=12{,}63648982\cdot 1{,}018239^{9}=14{,}87\_millions\_tons$$
$$\gamma_{2025}^{PAPAYA'S\_WORLDWIDE\_PRODUCTION}=12{,}63648982\cdot 1{,}018239^{10}=15{,}14\_millions\_tons$$



Graph 5 The exponential projection for the values which show us the evolution concerning the papaya's worldwide production

7. Conclusions

The oranges's worldwide productions exhibits a linear model and the prognosis method indicates diminutions for these, between 2021-2025. We can see that, the bananas's worldwide productions cover an exponential projection and the prevision method expresses the swells for these phenomenons, in the same period. The dynamics concerning the lemons's worldwide productions will be in rise between 2021-2025, as effect of the quadratic model exhibited by these, trend which was inserted in the prevision method. As well, we can observe that, the mangos's worldwide productions covers a quadratic trend and these will be in increase in the same period. The variation in time regarding the papayas's worldwide productions will be in augmentation between 2021-2025 and these follow an exponential model.

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