DETECTION OF THE SEASONAL VARIATIONS OF POTATO SALES IN WHOLESALE MARKETS OF BAGHDAD PROVINCE DURING THE PERIOD (2010-2015) AND FORECASTING BY USING SEASONAL TIME SERIES MODELS(SARIMA)

K. S Rand **A.. D. K. Alhiyali**
Researcher **Prof.**
Dept. of Agricultural economics College of Agriculture University of Baghdad
adk_1966@yahoo.com

ABSTRACT

This research was aimed to detect the seasonal phenomenon of the monthly sales of potato crop in Baghdad for the period (January 2010 - December 2015), using the krusskle - Wallis method. The research also aimed to determine the shape of the time series of the monthly sales of the potato crop whether to follow additive or multiplicative model. The problem of the research is presence of the seasonal phenomenon in the monthly sales of the potato crop, which will be reflected in one way or another on the short-term planning process. According to the results obtained, the monthly sales of the potato crop were predicted at 60 observations for the period January 2016 - December 2020, where the results were consistent with those in the original time series. We conclude from the results obtained that the monthly sale of the potato crop contains seasonal variations and confirms the nature of the pattern that the potato crop has been affected by the season to a large extent. This research was concluded that there was an increase in sales of potato crop during specific months of the year. This is confirmed by the results of the research, which will be reflected in one way or another on the low prices in the months of high sales according to the law of supply and demand. The research included recommendations such as preventing import at peak time (peak season of production) and the need to work on the development of laws and legislation to protect local agricultural products. The research also recommended the imposition of taxes and customs duties on imported agricultural products and not to allow entry into Iraq during the peak season of production.

Keywords: seasonal variations, forecasting, chi square, SARIMA,
Part of MSc. Thesis for the first author

الكشف عن التغيرات الموسمية لمبيعات محصول البطاطا في اسواق الجملة لمحافظة بغداد خلال المدة (2010 – 2015) والتنبؤ بها باستخدام نماذج السلاسل الزمنية الموسمية(SARIMA)

رند قصي سامي العاني **علي درب كسار الحيالي**
الباحثة **استاذ**
جامعة بغداد – كلية الزراعة – قسم الاقتصاد الزراعي
adk_1966@yahoo.com

المستخلص

يستهدف البحث الكشف عن وجود ظاهرة الموسمية للمبيعات الشهرية لمحصول البطاطا في مدينة بغداد وللمدة (كانون الثاني 2010 – كانون الأول 2015)، فضلا عن تحديد شكل السلسلة الزمنية للمبيعات الشهرية لمحصول البطاطا هل تتبع الأنموذج التجميعي ام المضاعف. واخيرا التنبؤ بالمبيعات باستخدام نماذج السلاسل الزمنية الموسمية. تتمثل مشكلة الدراسة بوجود ظاهرة الموسمية في المبيعات الشهرية لمحصول البطاطا. وفقا للنتائج المتحصل عليها تم التنبؤ بالمبيعات الشهرية لمحصول البطاطا بواقع (60) مشاهدة وللمدة (كانون الثاني 2016 – كانون الأول 2020)، حيث اظهرت النتائج تناسقا مع مثيلاتها في السلسلة الزمنية الأصلية. ونستنتج من خلال النتائج المتحصل عليها ان المبيعات الشهرية لمحصول البطاطا تحتوي على مركبة الموسمية ويؤكد ذلك طبيعة النمط السائد في ان محصول البطاطا قد تأثر بالموسم الى حد كبير، كما واستنتج البحث وجود ارتفاع في مبيعات محصول البطاطا خلال اشهر معينة من السنة وهذا ما اكدته نتائج الدراسة الأمر الذي سينعكس بشكل او بآخر على انخفاض الأسعار في الأشهر التي ترتفع فيها المبيعات طبقا لقانون العرض والطلب، وقد تضمنت الدراسة توصيات بشأن ذلك فيما يتعلق بضرورة منع الاستيراد في وقت الذروة وضرورة العمل على وضع قوانين وتشريعات لحماية المنتجات الزراعية المحلية من المستورد واوصت الدراسة بضرورة فرض ضرائب ورسوم كمركية على المنتجات المستوردة وعدم السماح بالدخول الى العراق في موسم ذروة الإنتاج.

الكلمات المفتاحية: التغيرات الموسمية، التنبؤ، مربع كاي، السلاسل الزمنية الموسمية
جزء من رسالة الماجستير للباحث الاول

***Received:16/3/2017, Accepted:23/7/2017**

INTRODUCTION

Among the objectives of private and public institutions is expansion and growth to achieve satisfactory rates of welfare, stability and development for the purpose of achieving an acceptable and appropriate level of economic welfare of society, These two organizations combine to achieve this goal and because any economic activity is based on satisfying the desires of consumers in quantity and quality through the production of goods and services in quantities and specifications and providing them at the appropriate prices. However, the amount which consumers need and the prices at which they are sold are considered unknown or difficult to expect, but these must be known or at least estimated so that producers or relevant organizations can work and produce, and sales are likely to increase or decrease depending on different factors and circumstances, The ability to manage the production and sales process and then to predict both will have important implications for their future in general and will form the basis upon which plans, programs and decisions will be built(10). One of the objectives of establishing wholesale markets is to provide a marketing environment and a climate conducive to the commercial activity of fruit and vegetable crops according to international standards(18).It also contributes to improving the activity of agricultural crops on the basis of scientific studies, and build an integrated system of services for the bidding processes in the wholesale and purchase of vegetables and fruit, and identifying surplus agricultural crops and monitoring crop changes throughout the season by building an information base. As well as maintaining the safety and health of the consumer through direct supervision of the quality of agricultural crops, and to contribute to the service of the farms through the marketing of crops in one location and integrated services, and the provision of integrated civil service facilities, space that are suitable for farmers, traders , and consumers and providing maximum comfort for them(12). Potato is considered one of important agricultural crops in many countries of the world, including Iraq, which gives a profitable income to the farmer, Potato production is heavily influenced by natural conditions and factors, as well as seasonality in prices, resulting in sharp fluctuations in the level of supply of potato, or in price levels throughout the year (20). There is a great economic importance of the potato crop as statistics show a significant expansion of the cultivated areas of this crop in Iraq for several reasons, including high population and high standard of living as well as the spread of health food and awareness. It is very important to note the economic importance and knowledge of the contribution of these crops to the net farm income as well as to the quantity of imports and exports. The total imports of potato in Iraq in 2012 reached about 11.7 million kg at a value of 6.7 million dollars , while in 2014 it increased to about 26.4 million kgs and a value of 5.6 million dollars, as for the income of the farmers from the potato crop during the year 2012 is about (2.316 million dinars)(15). The economic analysis of the monthly sales of the potato crop is particularly important because of the importance of this commodity to both citizens and farmers. Studies of forecasting are especially important when it comes to sales planning because these crops have a great importance to the segments of society, which induced many researchers to study them using seasonal time series models as these models have high accuracy and flexibility in analysis(5). The problem of research is the seasonal phenomenon of sales of potato crop, which will be reflected in one way or another on the short-term planning process, In order to avoid bias in forecasting process, which is very important in future planning processes, these seasonal variations should be studied to be neutralized and excluded from the time series, this will make sales forecasting possible, Especially that seasonal variations take a more regular form of other variations such as cyclical variations and thus facilitate the process of forecasting and in turn reflected on the process of short-term planning. In addition, the presence of factors that neutralized the effect of the seasonal phenomenon and reduce the impact on the sales of potato crop. The research assumes the fluctuation of sales of potato crop may be due to the presence of the seasonality phenomenon and characterized by low volatility from one

season to another. The research also assumes that the form of the time series follows the multiplicative model. In addition the research assumes the benefit of using the seasonal time series models in the monthly sales forecast for the potato crop in Baghdad province. The research aims at analyzing of the monthly sales of potato crop in the city of Baghdad during the period (2010-2015) and studies the model of these variations if follow the multiplicative or additive model, also detect these seasonal variations to be excluded from the time series, finally, forecasting the monthly sales of the potato crop for a short period in the future using seasonal time series models (SARIMA). The research was based on secondary sources of monthly sales of potato crop in Baghdad during the period (January 2010 - December 2015), where it was obtained from the Ministry of Agriculture and the Ministry of Planning and related departments, which adopted an average price of vegetable crops. The subject of seasonal time series is an important subject. A large group of researchers have dealt with this issue, especially when it comes to forecasting and among these researchers (1, 2, 3, 4, 7, 13, 14, 17, and 18).

MATERIALS AND METHODS

This research was focused mainly on the data and information obtained from secondary data. The method used in the analysis for the purpose of detection of the seasonal variations will be using the statistical test called the Krusskal- Wallis (KW) and its formula is (9):

$$KW = \frac{12}{n(n-1)} \sum \frac{R_t^2}{m_i} - 3(n+1)$$

where KW follows a distribution χ^2 of degrees of freedom $df = p-1$

(p = number of seasons).

R_t^2 = Ranks of the phenomenon values or the values of the studied variable corresponding to the season i.

m_i = The number of values and views corresponding to the season i (more often m_i = number of years).

In order to determine the shape of the time series, whether to follow the multiplicative or additive model, the annual standard deviation method will be used to match the time series in the research. For the purpose of forecasting the time series, the Seasonal Autoregressive Integrated Moving averages (SARIMA) method will be used.

RESULTS AND DISCUSSION

The method of analysis consists of several steps that are inherently descriptive and analytical as there are sequential steps in detecting the seasonal variations for the monthly sales of the potato crop to be clarified as it follows:

First: Detection of the seasonal variations of the monthly sales of potato crop using the test (krusskl-wallis)

The first step: In this step, a table will be drawn up which includes the monthly data for the potato crop sales obtained from the Ministry of Agriculture. These data are the period from January 2010 to December 2015. The second step of setting a table in which the values of the string from the smallest value to the highest value of the ascending order of the monthly data of the potato crop, Finally, the seasonal variation is calculated by the aforementioned law, and all these details will be reviewed in practice until the final result is reached and interpreted.

Table 1. The monthly sales of potato crop for the period (2010-2015)

Month / *year*	*Jan* 1	*Feb* 2	*Mar* 3	*Apr* 4	*May* 5	*Jun* 6	*July* 7	*Aug* 8	*Sep* 9	*Oct* 10	*Nov* 11	*Dec* 12
2010	2677	3725	3491	4059	6433	7237	3765	1638	918	1110	938	2313
2011	5128	2927	1089	4530	6530	5547	5947	3687	4310	4139	2237	2815
2012	2287	2528	3255	3428	3623	4362	5698	2182	2103	1012	3866	2167
2013	3241	3072	2652	4985	2738	975	750	5540	3115	0	720	201
2014	2267	4558	4890	4490	3272	4989	6400	8410	7915	4000	2903	976
2015	5595	4662	4552	4278	5425	5035	3949	3960	260	212	2740	1343

Source: Ministry of Agriculture, Department of Agricultural Statistics.

Second step: Ranking the values of the string (R_t) from the smallest value to the larges t value according to the following table:

Table 2. The upward ranking of the monthly sales data of the potato crop

Year	Jan 1	Feb 2	Mar 3	Apr 4	May 5	June 6	July 7	Aug 8	Sep 9	Oct 10	Nov 11	Dec 12
2010	25	40	37	47	55	70	41	15	7	13	8	22
2011	60	30	12	53	69	64	67	39	50	48	19	28
2012	21	23	34	36	38	51	66	18	16	11	42	17
2013	33	31	24	57	26	9	6	63	32	1	5	2
2014	20	54	56	52	35	58	68	72	71	46	29	10
2015	65	61	45	49	62	59	43	44	4	3	27	14
$\sum Rt$	224	239	208	294	285	311	291	251	180	122	130	93

Source: (Based on data from Table 1)

$$KW = \frac{12}{n(n-1)} \sum \frac{R_t^2}{mi} - 3(n+1)$$

$$Kw = \frac{12}{72(72-1)} \sum \left[\frac{(224)^2}{6} + \frac{(239)^2}{6} + \frac{(208)^2}{6} + \frac{(294)^2}{6} + \frac{(285)^2}{6} + \frac{(311)^2}{6} + \frac{(291)^2}{6} + \frac{(251)^2}{6} + \frac{(180)^2}{6} + \frac{(122)^2}{6} + \frac{(130)^2}{6} + \frac{(93)^2}{6} \right] - 3(72+1)$$

$$Kw = \frac{12}{72(71)} \sum \left[\frac{50176}{6} + \frac{57121}{6} + \frac{43264}{6} + \frac{86436}{6} + \frac{81225}{6} + \frac{96721}{6} + \frac{84681}{6} + \frac{63001}{6} + \frac{32400}{6} + \frac{14884}{6} + \frac{16900}{6} + \frac{8649}{6} \right] - 3(73)$$

kw=0.0023∑[8362.7+9520.1+7210.7+14406+1357.5+16120.1+14113.5+10500.1+5400+2480.7+2816.7+1441.5]-219

Kw = 0.0023[105909.6]-219

Kw = 243.592-219

KW=24.592

Third step:

Calculation of the value χ^2: the third step, which is compared χ^2 with KW value to find out the presence or absence of the seasonal variations.

$$df = p-1 \qquad KW = 24.592$$

$$df = 12-1 = 11 \qquad \chi^2_{0.05} = 19.675$$

$$\chi^2_{0.05} \langle KW$$

There is a seasonal variation in the monthly sales of the potato crop because the value of KW is greater than the value of χ^2.

Second: Determination of the shape of the time series of the monthly sales of the Potato crop

After confirming the existence of the seasonal variations in the sales of the monthly potato crop, we determine the shape of these variations (within the whole time series) whether it is multiplicative or additive. There are several ways to detect the shape of the time series, but the method used is the annual standard deviation. In this method, we determine the annual standard deviation for each year. If the values of the standard deviations are equal or convergent, then we have additive model, but if we have divergent values, then we have a multiplicative model. The annual average deviations of the potato crop sales for all years were (1175.8, 567.5, 629.5, 696.4, 1366.4, and 1279.6). The values of the deviations were not constant. The increase and decrease between years and this indicates that the type of model is multiplicative.

Third: forecasting the monthly sales of potato crop using seasonal time series models (SARIMA)

After several steps, an initial plot of the time series is used to identify its initial properties, then testing the stationary of the time series, In order to obtain stationary in the variance of the time series, the natural logarithm (LN) of the data is processed once and the square root is taken again. In order to test the stationary of the time series, the values of the (ACF) and (PACF) coefficients will be extracted, as shown in the figure below, which shows the non- stationary of the time series as it lies outside the confidence intervals and therefore the values of the coefficients of (ACF) extracted at the 71 gap was around 132.06, while the value of χ^2 at the same gap is equal to 86.635, The decision is as follows:

$$LBQ = 132.06$$

$$\chi^2_{0.05,71} = 86.635$$

$$LBQ \rangle \chi^2_{0.05,71}$$

Therefore, we reject the null hypothesis that all autocorrelation coefficients|(ACF) are equal and equal to zero:

$$H_0 = \rho_1 = \rho_2 = \rho_3 = \Lambda\Lambda = \rho_K = 0$$

We accept the alternative hypothesis, which means that the time series is non-stationary.

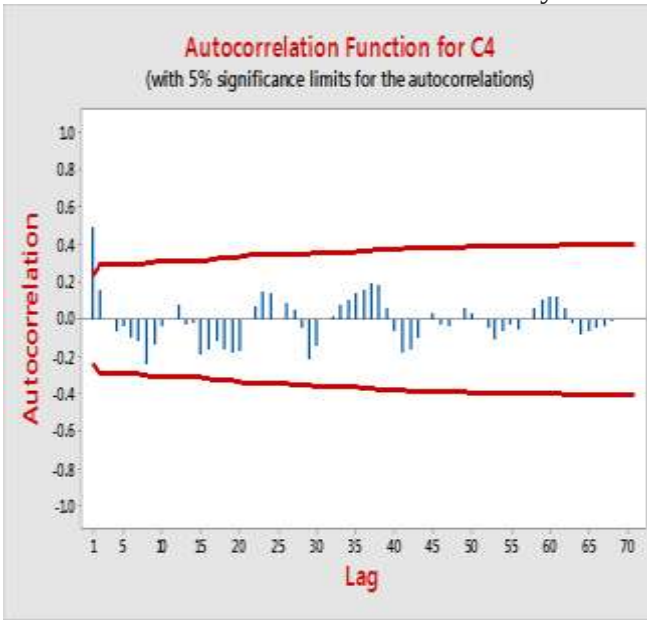

Figure 1. The autocorrelation function of the original data of the sales of the Potato crop

Removing the non-stationary of the time series: In order to remove the non-stationary of the series, the first difference was taken in the modified data. Thus we obtained a stable time series as shown in the following figure(2).To confirm this, the results extracted for the values of the coefficients of autocorrelation after taking the first difference may differ significantly from what it was before taking the first difference and this is illustrated in the following table. The value of LBQ after taking the first difference at gap 70 is about 76.98 and if compared to the value of χ^2 at 0.05 and 70 (85.527) the decision is as follows:

$$LBQ = 76.98$$

$$\chi^2_{0.05,71} = 86.527$$

$$LBQ \langle \chi^2_{0.05,71}$$

Depending on results above, we conclude, the model is good, appropriate and efficient, thus time series is stable and lies within the confidence limits.

Table 3. Values of the autocorrelation coefficients after taking the first difference

Lag	ACF	T	LBQ	Lag	ACF	T	LBQ	Lag	ACF	T	LBQ
1	-0.143649	-1.21	1.53	25	-0.194936	-1.27	34.10	49	0.092225	0.53	61.16
2	-0.230500	-1.90	5.52	26	0.088642	0.56	35.01	50	0.016728	0.10	61.23
3	-0.082673	-0.65	0.04	27	0.100453	0.63	36.20	51	0.018618	0.11	61.32
4	-0.049777	-0.39	6.26	28	0.102619	0.65	37.47	52	0.013784	0.08	61.37
5	0.080268	0.63	6.74	29	-0.284021	-1.77	47.42	53	-0.098400	-0.57	64.16
6	-0.030045	-0.23	6.81	30	-0.077490	-0.46	48.18	54	0.004663	0.03	64.17
7	7.101679	0.79	7.65	31	0.150292	0.90	51.11	55	0.075010	0.43	65.99
8	-0.246486	-1.89	12.64	32	-0.036415	-0.22	51.28	56	-0.084188	-0.48	68.44
9	0.016432	0.12	12.67	33	0.020730	0.12	51.34	57	-0.051756	-0.29	69.43
10	0.065244	0.48	13.03	34	-0.000546	-0.00	51.34	58	0.034887	0.20	69.92
11	-0.040246	-0.29	13.17	35	0.015196	0.09	51.38	59	0.033168	0.19	70.39
12	0.157971	1.15	15.36	36	-0.016825	-0.10	51.42	60	0.013569	0.08	70.48
13	-0.108667	-0.78	16.42	37	0.048714	0.29	51.78	61	0.044420	0.25	71.50
14	0.198864	1.41	20.01	38	0.085531	0.50	52.93	62	0.021214	0.12	71.76
15	-0.183932	-1.27	23.14	39	0.019935	0.12	52.99	63	-0.032045	-0.18	72.43
16	-0.006985	-0.05	23.15	40	-0.007359	-0.04	53.00	64	-0.055809	-0.32	74.73
17	0.080746	0.55	23.77	41	-0.120304	-0.71	55.50	65	0.009522	0.05	74.81
18	-0.040388	-0.27	23.93	42	-0.058175	-0.34	56.11	66	0.025870	0.15	75.50
19	-0.031742	-0.21	24.03	43	-0.022473	-0.13	56.20	67	-0.0210	-0.12	76.08
20	-0.167135	-1.12	26.87	44	0.060307	0.35	56.90	68	-0.006278	-0.04	76.15
21	0.115807	0.76	28.26	45	0.076951	0.45	58.08	69	0.015849	0.09	76.80
22	-0.017773	-0.12	28.30	46	-0.040789	-0.24	58.42	70	-0.006012	-0.03	76.98
23	0.073368	0.48	28.88	47	-0.052868	-0.31	59.03				
24	0.092548	0.60	29.82	48	-0.024085	-0.14	59.16				

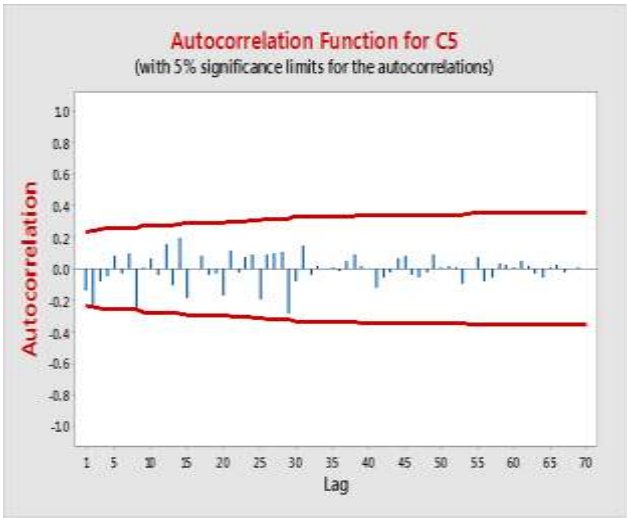

Figure 2. The autocorrelation function of potato sales after taking the first difference

Diagnosis: It is intended to identify the model through the rank of (AR, MA), depending on the form of the attributes of (PACF), will be known as the appropriate model in which all the values of the coefficients are significant and thus is the appropriate model and therefore the best model followed the monthly sales of potato crop is a model SARIMA $(0,1,2)(1,1,0)_{12}$.

Estimation:

We found that the appropriate model SARIMA $(0,1,2)$ $(1,1,0)_{12}$ based on the statistical program (MINITAB) obtained the results listed in the table below It was logical that all the values of the coefficients were significant and so observed that all parameters were statistically significantز

Table4. Results of SARIMA model $(0,1,2)(1,1,0)_{12}$

Final Estimates of Parameters

Type		Coef	SE Coef	T	P
SAR	12	-0.6583	0.1235	-5.33	0.000
MA	1	0.5024	0.1134	4.43	0.000
MA	2	0.5176	0.1200	4.31	0.000
Constant		40.046	7.185	5.57	0.000

Differencing: 1 regular, 1 seasonal of order 12
Number of observations: Original series 72, after differencing 59
Residuals: SS = 179083583 (backforecasts excluded)
MS = 3256065 DF = 55

Modified Box-Pierce (Ljung-Box) Chi-Square statistic

Lag	12	24	36	48
Chi-Square	13.4	28.7	35.3	39.3
DF	8	20	32	44
P-Value	0.098	0.094	0.317	0.673

Forecasting: The last step is that using the forecasting model mentioned above, the monthly sales of the potato crop in the city of Baghdad during the period from (January 2016 to December 2020), (60) observations. The forecasted sales were realistic, as it was noted that there was an increase in the volume of sales obtained in the coming years. This is logical if it is linked to the high forecast prices of the potato crop. This indicates that in the coming years, farmers will encourage the use of land for planting this crop which led to higher sales volumes in the coming yearsز

Table 5. Predicted values of monthly sales of potato crop for the period (2016-2020)

الأشهر / السنوات	Jan 1	Feb 2	Mar 3	Apr 4	May 5	June 6	July 7	Aug 8	Sep 9	Oct 10	Nov 11	Dec 12
2016	3680.23	4927.80	5118.64	4757.46	4268.00	5335.93	5977.73	7371.94	5889.63	3165.87	3185.55	1421.82
2017	5337.92	5075.10	5059.32	4758.46	5401.35	5460.47	4906.71	5343.81	2326.98	1459.70	3210.01	1700.04
2018	4523.64	5302.48	5433.13	5090.53	4949.89	5707.06	5980.57	7079.93	5124.92	2971.50	3525.85	1840.29
2019	5419.84	5477.91	5507.23	5193.52	5595.04	5869.19	5570.28	6211.39	3521.65	2254.72	3640.07	2076.01
2020	5132.48	5689.28	5788.27	5455.02	5481.39	6089.77	6186.94	7145.14	4963.79	3083.46	3893.80	2245.66

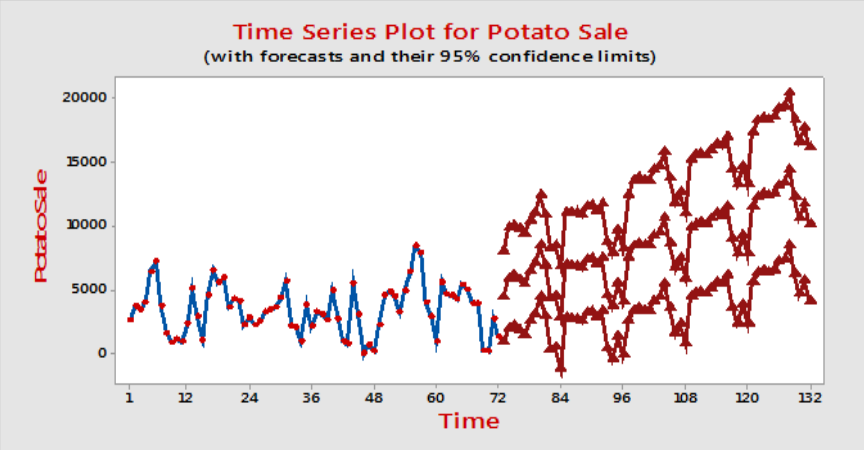

Figure 3. Predicted values of monthly sales of potato crop for the period (2016-2020)

By observing the figure above, it is clear that the predicted time series of sales is very close to the original time series of the monthly sales of the potato crop. It is thus shown that the predicted sales time series follows the same behavior as the original series, and the seasonal variations change regularly. We conclude from the research, the monthly sales of the potato crop contain the seasonal composition and this confirms the nature of the pattern that the crop under consideration (Potato) has been affected by the season to a large extent. Also we conclude from the obtained results that there is a general trend in sales of potato crop, which confirms the fact that sales are going to increase annually. This is confirmed by the predicted sales for the period (January 2016 - December 2020). In addition, potato crop in certain months of the year influenced by the increase in several factors, including increasing population numbers and the growing desire for people to consume this crop, which occupies a large space at the table of the Iraqi consumer. From these results we conclude that the multiplicative model has been better expressed through predictive values, which are mostly consistent with the original data pattern. Depending on the conclusions above research recommends preventing the import of this crop at the peak time and this is what is used in the plan of the Ministry of Agriculture in Iraq, where the study confirmed the need to continue this approach. Although the production of greenhouses has affected the sales of crops under consideration, but they have another role in controlling the rise in prices and therefore the research recommends that this production is balanced so as to affect the mechanism of supply and demand and balance was obtained naturally without the external effects. Because some results were affected by the accuracy of the data used, which sometimes we had to estimate the missing data, the research recommends the need for accurate records containing different data on different crops and provide researchers with these data as accurately as possible. The results of the research studies should be presented to the concerned parties so that they can avoid errors and make the most of these results. Disseminating this research to the corresponding studies at the level of the other provinces and even at the level of countries for comparison and try to know the similarities and differences between them. The study recommends the need to work on the development of laws and legislation to protect the local agricultural products from the imported products such as the imposition of taxes and increase customs duties on imported agricultural products and not allow the imported products to enter Iraq in the peak season of production. Finally, the research recommends the development of agricultural investments.

REFERENCES

1. Al – Khafaji, M and F. A. Al- Mukhtar. 1989, " Fruit and Vegetable Production ", Bayt Al – Hikma , Baghdad University Ministry of Higher Education and Scientific Research . pp:75

2. Al – Mohammadi, N. A. and S.T, Abdel – Karim. 2011. Using Seasonal Time Series Models to Predict Power Consumption in Fallujah City. M.Sc. Thesis, Coll. of Man and Eco., Uni. of Anbar.pp.80

3. Al- Safawi, S. Y. and B. A. Mustafa . 2010. Comparison of the adaptive technology techniques and the multiplication of the prediction of seasonal time series values .Coll. of Management and Economics., Univ. of Mosul.32(2)120-128

4. Al-Sultan, M.M. 2010. Analysis of Seasonal Changes Average Wholesale and Retail Prices and Marketing Margin of the Most Important Data Varieties in Saudi Arabia for the Period from January 2004-December 2008. M.Sc. Thesis. Dept. of Agricultural Economics, Coll. of Science for Agriculture, Univ. of King Saud .pp:186.

5. Al – Wardy, A. H. 1990. Method of Statistical Prediction Methods and Applications. Coll. of Management and Economics. Univ. of Basrah, Dar al – Hikma press in Basra, Iraq .pp:87

6. Arab Organization for Agricultural Development (AOAD), Food and Agricultural Organization of the Nations (FAO) Arab Food Development Organization (AOAD).

7. Ben Qismi, T. 2014. Using Seasonal Time Series Models to Forecast Electrical Power Sales Case Study of National Electricity and Gas Company. M.Sc. Thesis, Coll. of Economic, Commercial and Applied Sciences, Univ. of Mohamed Khasair, Algeria .pp:101

8. Berri, A. M. 2002. Methods of Statistical Prediction. Dept. of Statistics and Operations Research., Coll. of. Sci., Univ. of king Saud.pp.104

9. Box, G. E. P. and G., M . T. Jenkins. 1976. Time Series Analysis Forecasting and Control " san Francisco, Holden – Day, U.S.A.pp:265

10. Dabbagh, J.M. J. 2014. Economics of Agricultural Marketing. Part II, 1st ed. Baghdad – Iraq. pp:86

11. Global statistical bulletins through the site WWW. Bank.com

12. Ismail, S. M. and M. Al- Knaibt.1995 .Agricultural Marketing", Dar Al- Marikh Publishing, Riyadh, Saudi Arabia.pp:75

13. Lakkhi, F. 2014. Quality of Mixed Seasonal Time Series Models SARIMA in Sales Forecasting Prediction Case study of New Mills, MSc. of Thesis. Dept. of. Facilitation Sciences., Coll. of Economic and Comm Sci and Facilitation Sci., Mohammed Univ. of Khodair. Biskara. Algeria. pp:145

14. Majid, H. H. 2012 . Using Seasonal Time Series Techniques to Address Differences in Consumer Price Index. M.Sc. Thesis, Coll. of Management and Economics., Univ. of Baghdad .pp:125

15. Ministry of Agriculture, 2015, Data on Area, Production, Productivity and Prices of Vegetable Crops Under Study Director of Planning and Follow up Department of Agricultural Economics, Baghdad, Iraq .pp:123

16. Ministry of Planning and Development Cooperation. 2009, Annual Statistical Report , Agricultural statistical, Baghdad, Iraq.pp:76

17. Ruqaya, K.M . 2010 . Fitting ARIMA Model for forecasting to In flow of Dokan Reservoin the Iraq , J. for Mechanical and Material Engineering Special Issue (A)" , Coll. of Engineering Univ. of Baghdad.5:75-86

18. Sharkawy and others, 2013, " Market structure and seasonal fluctuations of the quantities and prices of tomato for the wholesale and fruit market in Alessandria Governorate, Dept. of Economics and Agricultural Business Administration., Coll. of Agric., Univ. of Alessandria.pp:78

19. Sheikhi, M.2012. Methods of Econometric Lectures and Applications " , Dar al – Hamed publishing and Distribution , Jordan , Amman.pp:126.