Price Analysis of Pulses in APMC Ahmednagar

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Abstract

India is the largest producer 26 per cent and consumer 30 per cent pulses at the world level. The domestic production of around 25-28 million tones during 2020-21, though it is less than the future estimated demand of 29-30 million tones at domestic level. In view of importance of pulses in balanced diet and farmer's economy, it becomes imperative to study Price Analysis of Pulses in domestic market. In view the present study was undertaken for period of 10 years from 2009-10 to 2017-18 of APMC market Ahmednagar district. The secondary data of arrivals and prices of major pulses (Pigeon Pea and Gram) were collected from APMC Ahmednagar.

Data was analyzed to compute the growth rates, trends, seasonal indices and variability in arrivals and prices and polynomial trend analysis and forecasted of major pulses. The highest prices of red gram crop were found in the year 2016, which was 82.34 per cent over the base year, while prices are more or less similar except the year 2015 and 2016. In case of chick pea crop, the highest prices were found in the year 2016, which was 171.30 per cent over the base year, while in the rest of years prices were ranged from Rs. 2000 per quintal to Rs. 4000 per quintal. In case of red gram ,the price index for the month of December was highest 109.57 per cent followed by November 103.79 per cent and for chick pea the price index for the month of October was highest 113.86 per cent followed by December 106.55 per cent.

The maximum variation in arrivals of pigeon pea was found in the month of November (1182.95 quintals) followed by September (758.46 quintals) and October (646.60 quintals) and the maximum variation in arrivals of chick pea was found in the month of December which was 330.61 per cent followed by November (287.55 per cent). The correlation coefficients of both crops were negative during the whole year indicating that increased arrivals resulted into decreased in prices; in this case the phenomenon of inverse relationship is proved.

In case of Polynomial trend line for pigeon pea and chick pea crop from the year 2009 to 2018 the order of two polynomial trend line has been found it clearly indicates that there is only one hill found in the sample. This clearly indicates that prices of the pigeon pea and chick pea crop were increased in the middle period and decreased in initial and last period. The less arrivals of pigeon pea and chick pea were observed during the months of April to November and September to December, respectively. Therefore, farmers are advised to schedule the sale of pigeon pea and chick pea in Ahmednagar APMC during the identified period to get the better prices for their produce.

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Introduction

Pulses are part of a healthy, balanced diet and have an important role in preventing illnesses such as cancer, diabetes and heart disease. India is the largest producer as well as consumer of pulses (also referred to as grain legumes, peas & beans) in the world. Pulses are mainly being grown on marginal and sub-marginal lands under rainfed conditions with low input usage.

India has 35 per cent share in global area and production and is largest producer and consumer of pulses – Chickpea (Gram), Pigeon pea (Tur), Black gram and green gram. The production of pulses increased from 14.66 million ton to 25.23 million ton from 2009-10 to 2017-18, also area under pulses increased from 23.28 million ha. to 29.99 million ha. India stands first in the world by producing 30,849 thousand MT of pulses and contributing 21.75 per cent to World production. Although the average yield of pulses (588 kg./ha.) is far below the world's average yield (958 kg./ha.) The major pulses growing states are Madhya Pradesh, Rajasthan and Maharashtra.

Maharashtra accounts for 13.09 per cent of India's total pulses area (3 rd rank) and 13.09 per cent of production of pulses after Madhya Pradesh and Rajasthan. The area and production of pulses in the state is 4.35 million hectare and 3.30 million ton., respectively, while productivity is 759 kg./ ha. The major pulses growing districts included Osmanabad, Wardha, Nasik, Nagpur, Jalgaon, Amravati, Akola, Ahmednagar, Prabhani and Sangli.

In view of importance of pulses in balanced diet and farmers economy, it become imperative to study Price Analysis of Pulses in APMC Ahmednagar with following objectives.

i) To study trends in arrivals and prices of pulses.

ii) To study the seasonal indices of arrivals and prices of pulses.

iii) To study the variability in arrivals and prices of pulses.

iv) To study the Polynomial Trend Analysis of pulses.

Methodology

The present study was undertaken of 10 years from 2009-10 to 2017-18 of Ahmednagar district. The secondary data of arrivals and prices of major pulses (Red gram and Gram) were collected from APMC Ahmednagar. The collected data were further compiled and analysed keeping in view the objectives of the study.

Data was analyzed to compute the growth rates, trends, seasonal indices and variability in arrivals and prices of major pulses.

I. Trends in Arrival and Prices

The growth rate of arrivals and prices of major pulses were estimated by using semi log trend equation.

$$Ya = ab^t \text{ and } Yp = ab^t$$

CGR (%) = (antilog b – 1) x 100

Ya and Yp = Monthly arrivals and prices respectively

a = Constant

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b = Trend Coefficient

t = Time Period

II. Seasonal indices of arrivals and prices of Major pulses

The seasonal indices of major pulses were worked out by ratio to moving average method.

III. Variability in Arrivals and Prices

$$CV = SD/Mean \times 100$$

Where,

CV= Coefficient of variation

SD= Standard Deviation

Mean= $\sum X/N$

X =Monthly arrivals and prices

N= Number of years

IV. Polynomial Trend Analysis

Polynomial Regression

i. Polynomial regression is regression of the criterion on a predictor raised to powers, i.e.: $Y=a + b_1X_1 + b_2X_1^2 + b_3X_1^3 + ...$

ii. This regression must be performed hierarchically, testing the change in R^2 as each higher order term is added to the model. The predictors in a polynomial are highly correlated so it is not wise to interpret the b's out of context. The best interpretation of a polynomial regression is given by a graph of the predicted values.

Result and Discussion

I. Changes in Arrivals and Prices of Red gram (Tur)

The change in arrivals and prices of Red gram are depicted in Table 1 it can be revealed from the table that the highest arrivals was found in the year 2017 i.e. 19,901 quintals, which was 89.59 per cent over the base year (2009-10), while lowest arrivals in the year 2014 (594.83 q.) which was 94.33 per cent less over the base year (2009-10). The highest prices of red gram crop were found in the year 2016, which was 82.34 per cent high over the base year, while prices are more or less similar except the year 2015 and 2016.

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Table 1. Changes in Arrivals and Prices of Red gram crop in APMC Ahmednagar

Year	Arrival (q.)	% Change Over 2009	Price (Rs./q.)	% Change Over 2009
2009	10497	--	3606.25	--
2010	12956	23.43	3496.92	-3.02
2011	17551	67.20	3233.70	-10.32
2012	14822	41.20	3583.33	-0.63
2013	2739	-73.91	3961.46	9.86
2014	594.83	-94.33	3720.25	3.17
2015	6486	-38.21	6501.75	80.30
2016	3957	-62.30	6575.04	82.34
2017	19901	89.59	3604.17	-0.05
2018	10862	3.48	3531.29	-2.07

II. Changes in arrivals and prices of Gram

The change in arrivals and prices of gram are presented in Table 2 the highest arrivals was found in the year 2017, i.e 2919.83 quintals which was 89.28 per cent more over the base year (2009-10) and lowest arrivals was found in the year 2013 i.e just 311.91 quintals which was 79.78 per cent below the base year. The highest prices of gram crop were found in the year 2016, (Rs.5929.21/ q.) which was 171.30 per cent over the base year, while in the rest of years prices were ranged from Rs. 2000 to Rs. 4000 per quintal.

Table 2.Changes in Arrivals and Prices of Gram crop in APMC Ahmednagar

Year	Arrival (q.)	% Change Over 2009	Price (Rs./q.)	% Change Over 2009
2009	1542.58	--	2185.46	--
2010	2563.08	66.16	2026.13	-7.29
2011	1539.16	-0.22	2614.50	19.63
2012	982.00	-36.34	3741.75	71.21
2013	311.91	-79.78	3431.50	57.01
2014	1228.33	-20.37	2919.54	33.59
2015	1708.66	10.77	3992.96	82.70
2016	1160.41	-24.77	5929.21	171.30
2017	2919.83	89.28	4914.63	124.87
2018	1478.58	-4.15	3501.46	60.21

III. Compound growth rates of arrivals and prices of Red gram

Annual compound growth rate of arrivals and prices of red gram were estimated and presented in Table 3. It can be revealed that, in period I (2009 to 2013), the arrivals of red gram was declined by 22.5 per cent and in period II (2014 to 2018), it was increased by 21.66 per cent. In case of prices, in period I (2009 to 2013), the prices was increased by 2.15 per cent and in period II (2014 to 2013), it was decreased by 6.71 per cent.

In overall level, an arrival of red gram was decreased by 3.38 per cent on the country prices have increased by 3.26 per cent. Importantly, for all the periods under consideration, the CGR for both arrivals and prices were non- significant.

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Table 3. Annual compound growth rates of Arrivals and Prices of Red gram crop in APMC Ahmednagar

Sr.No.	Periods	Arrival	Prices
1	Period I (2009-2013)	-22.53	2.15
2	Period II (2014-2018)	21.66	-6.71
3	Overall (2009-2018)	-3.38	3.26

(*,**,and *** indicates significant at 10,5 and 1 per cent level of significance)

IV. Compound growth rates of arrivals and prices of Gram

Annual compound growth rate of arrivals and prices of gram were estimated and presented in Table 4. It can be revealed that, in period I (2009 to 2013), the arrivals of gram were significantly declined by 34.01 per cent and in period II(2014 to 2018), it was increased by 9.49 per cent, but found to be non significant. In case of prices, in period I (2009 to 2013), the prices were significantly increased by 16.37 per cent and period II (2014 to 2013), it was increased by 5.87 per cent, but turned out to be non - significant.

During the overall period, the arrivals of gram have increased by 1.31 per cent but turns out to be non-significant, while prices significantly increased by 9.22 per cent.

Table 4. Annual compound growth rates of Arrivals and Prices of Gram crop in APMC Ahmednagar

Sr. No.	Periods	Arrival	Prices
1	Period I (2009-2013)	-34.01*	16.37**
2	Period II (2014-2018)	9.49	5.87
3	Overall (2009-2018)	1.31	9.22***

(*,**,and *** indicates significant at 10,5 and 1 per cent level of significance

V. Seasonal Indices of arrival and prices of Red gram

Seasonal Indices of red gram were estimated over a period of ten year from 2008-09 to 2017-2018 and are presented in table 5.

Table. 5. Seasonal Indices of Arrivals and Prices of Red gram crop in APMC Ahmednagar

Month	Arrivals		Prices	
	Mean (q.)	Seasonal Indices	Mean (Rs./q.)	Seasonal Indices
January	2600.50	291.91	4188.35	100.17
February	2580.20	289.63	3932.60	94.05
March	1695.90	190.37	4017.55	96.08
April	762.90	85.64	4105.05	98.17
May	666.60	74.83	4042.80	96.68
June	512.10	57.48	4122.50	98.59
July	467.50	52.48	4215.00	100.80
August	217.30	24.39	4305.00	102.96

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September	155.50	17.46	4037.60	96.56
October	182.40	20.47	4288.75	102.57
November	99.70	11.19	4340.05	103.79
December	749.70	84.16	4581.75	109.57

The result of analysis revealed that the peak arrivals of red gram were concentrated in month of January to March. The indices of arrivals were lowest during the month of November (11.19 per cent). The seasonal indices regarding prices revealed that, there were less fluctuations in prices as it is ranged between 94.05 to 109.57 per cent. The price index for the month of December was highest 109.57 per cent followed by November 103.79 per cent.

VI. Seasonal Indices of arrival and prices of Gram

Ten years (2008-09 to 2017-18) data on arrivals and prices of gram was analysed to estimate the seasonal indices and are presented in table 6. The result of analysis revealed that the peak arrivals of gram were concentrated during the months of February to April. The indices of arrivals were lowest during the month of December (32.23 per cent). The seasonal indices regarding prices revealed that, there were less fluctuation in prices as it is ranged between 91.12 to 113.86 per cent .The price index for the month of October was highest 113.86 per cent followed by December 106.55 per cent.

It can be concluded for both tur and gram crops on the basis of seasonal indices analysis that, prices for both the crops were more stable than that of arrivals during the study period.

Table. 6. Seasonal Indices of Arrivals and Prices of Gram crop in APMC Ahmednagar

Month	Arrivals		Prices	
	Mean	Seasonal Indices	Mean	Seasonal Indices
January	1120.70	72.61	3469.05	98.39
February	3728.40	241.56	3230.05	91.61
March	3656.30	236.89	3212.75	91.12
April	2421.60	156.89	3370.10	95.59
May	1221.10	79.11	3380.05	95.87
June	1341.10	86.89	3336.10	94.62
July	1206.20	78.15	3616.25	102.57
August	1256.90	81.43	3623.00	102.76
September	639.00	41.40	3716.25	105.40
October	860.70	55.76	4014.50	113.86
November	572.00	37.06	3583.80	101.65
December	497.50	32.23	3756.65	106.55

VII. Correlation between arrivals and prices of Red gram and gram in APMC, Ahmednagar

Co-relation indicates the relationship between market arrivals and prices of red gram and gram crops. The phenomenon of inverse relationship between arrivals and prices is well known. The degree of relationship between market arrivals and prices of red gram and gram crops were studied for 12 months over the

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period from 2008-09 to 2017-18 by computing correlation coefficient. The results of correlation analysis are depicted in table 7.

Table 7.Correlation in Arrivals and Prices of Red gram and Gram crop in APMC Ahmednagar

Months	Red gram	Gram
January -June	-0.19	-0.88
July-Dec	0.65	-0.18
Annual	-0.40	-0.75

It can be revealed from table that, there exist negative relationship between market arrivals and prices of both crops in APMC, Ahmednagar for whole year. This implies that, arrivals and prices of both crops have moved in opposite direction in APMC, Ahmednagar during the study period. This might be due to heavy demand for these crops. The correlation coefficients were negative during the whole year indicating that increased arrivals resulted into decreased in prices.

The only exception was observed during July- December in case of red gram. This was due to lower and comparatively unstable arrivals of red gram during the period.

VIII. Variability of arrivals and prices of Red gram crop

The pattern of market arrivals and prices variability of red gram crop during the period 2008-09 to 2017-18 was examined by using the coefficient of variation for the 12 months and the details are depicted in table 8.

It can be revealed from table, that the maximum variation in arrivals was found in the month of November (1182.95 %) followed by September (758.46 %) and October (646.60 %), while less variation in arrivals was found in the month of January (45.35 %) followed by February (45.71 %).

In case of prices the Co- efficient of variation ranges from 29.41 to 34.26 per cent, this clearly indicates that there was a less variation in the prices of the red gram crop.

Table 8. Variability in Arrivals and Prices of Red gram crop in APMC Ahmednagar

Month	Arrivals		Prices	
	Mean (q.)	CV (%)	Mean (q.)	CV (%)
January	2600.50	45.35	4188.35	32.17
February	2580.20	45.71	3932.60	34.26
March	1695.90	69.54	4017.55	33.54
April	762.90	154.59	4105.05	32.82
May	666.60	176.93	4042.80	33.33
June	512.10	230.31	4122.50	32.69
July	467.50	252.28	4215.00	31.97
August	217.30	542.75	4305.00	31.30
September	155.50	758.46	4037.60	33.37
October	182.40	646.60	4288.75	31.42
November	99.70	1182.95	4340.05	31.05
December	749.70	157.32	4581.75	29.41

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IX. Variability of arrivals and prices of gram crop

It can be revealed from the table 9 that, the maximum variation in arrivals was found in the month of December which was 330.61 per cent followed by November (287.55 %). Lowest variation in arrivals was found in the month of February (44.11 %) followed by March (44.98 %).

In case of prices of gram crop, Co-efficient of variation ranges from 32.74 per cent to 40.91 per cent, this clearly indicates that there is less variation in the prices of the gram crop.

Table 9. Variability in Arrivals and Prices of Gram crop in APMC Ahmednagar.

Month	Arrivals		Prices	
	Mean (q.)	CV (%)	Mean (q.)	CV (%)
January	1120.70	146.76	3469.05	37.89
February	3728.40	44.11	3230.05	40.69
March	3656.30	44.98	3212.75	40.91
April	2421.60	67.92	3370.10	39.00
May	1221.10	134.69	3380.05	38.88
June	1341.10	122.64	3336.10	39.40
July	1206.20	136.36	3616.25	36.34
August	1256.90	130.86	3623.00	36.28
September	639.00	257.40	3716.25	35.37
October	860.70	191.10	4014.50	32.74
November	572.00	287.55	3583.80	36.67
December	497.50	330.61	3756.65	34.99

X. Polynomial trend analysis

Polynomial trend analysis for prices of red gram crop were estimated and presented in table 10.

Polynomial trend line is a curved line that is used when data fluctuates, It is useful for example of analyzing gains and losses over a large data set. The order of polynomial can be determined by the number of fluctuations in the data or by how many bends (hill /valleys) appear in curve. An order of two polynomial trend line generally has only one hill or valley; Order of three polynomial trend line generally has two hills or valleys. Order of four polynomial trend line generally has up to three.

Table 10. Polynomial trend analysis of Red gram crop in Ahmednagar APMC

$Y_t = 4425.27-128.32T+3.39T^2-0.02T^3+e_t$

Sr. No.	Variables	Coefficients	S.E.
1	Intercept	4425.27	
2	T	-128.32	26.77
3	T^2	3.39	0.51
4	T^3	-0.02	0.00
5	R^2	0.45	--
6	F	32.00	--

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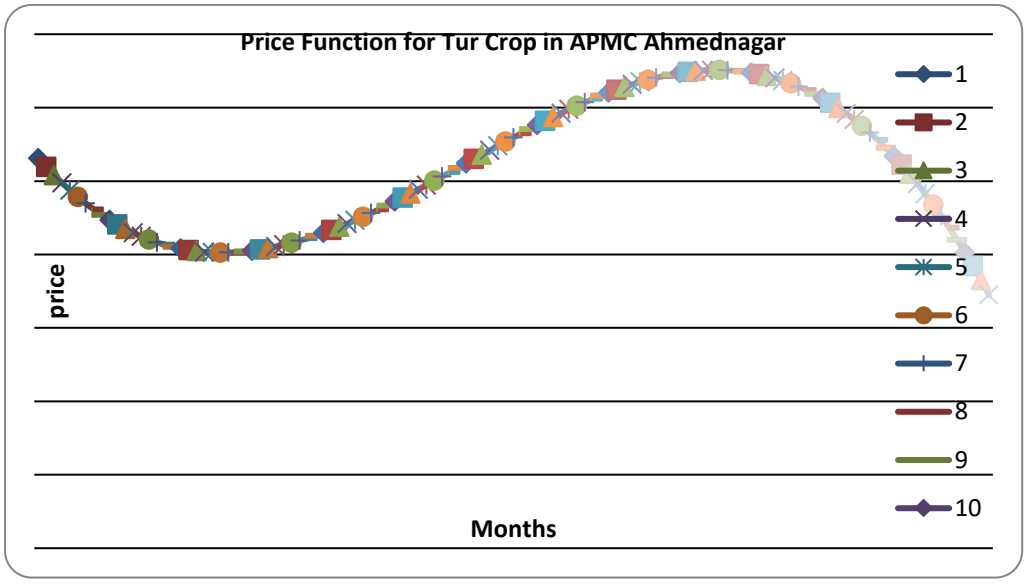
From the table 10, it can be revealed that in first time period T , the co-efficient was -128.32 . In second time period T, the co-efficient was positive and it was 3.39 and in third time period it was again negative i.e. -0.02. This clearly indicates that there are second order polynomial trends in the prices of red gram crop.



From the table 11, it can be revealed that in first time period T, the co-efficient was -41.14. In second time period T, the co-efficient was positive and it was 1.72 and in third time period it was again negative i.e. -0.01. This clearly indicates that there are second order polynomial trends in the prices of gram crop.

Table 11. Polynomial trend analysis of Gram crop in Ahmednagar APMC

$$Y_t = 2425.55-42.14T+1.72T^2-0.01T^3+e_t$$

Sr. No.	Variables	Coefficients	S.E.
1	Intercept	2425.55	
2	T	-42.14	23.72
3	T^2	1.72	0.45
4	T^3	-0.01	0.002
5	R^2	0.54	--
6	F	46.62	--

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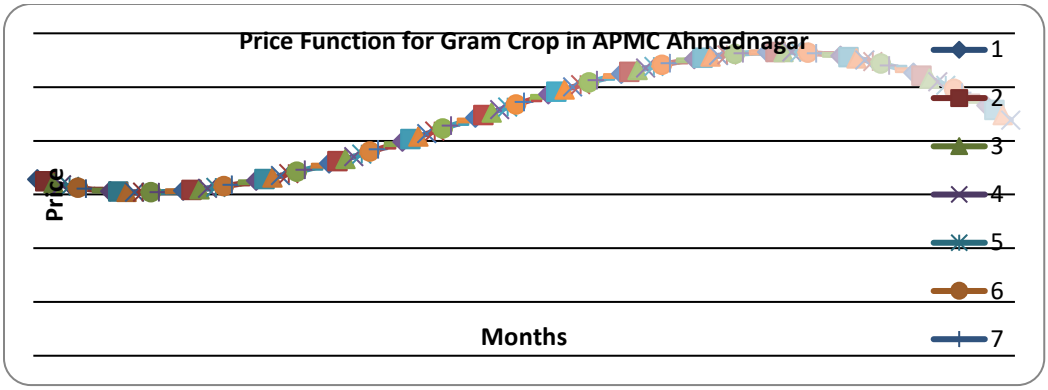

In case of Polynomial trend line for red gram and gram crop from the year 2009 to 2018 the order of two polynomial trend line has been found it clearly indicates that there is only one hill found in the sample. This clearly indicates that prices of the red gram and gram crop were increased in the middle period and decreased in initial and last period.

Conclusions

i) The highest prices of red gram crop were found in the year 2016, which was 82.34 per cent over the base year, while prices are more or less similar except the year 2015 and 2016. In case of gram crop, the highest prices of gram crop were found in the year 2016, which was 171.30 per cent over the base year, while in the rest of years prices were ranged from Rs. 2000 per quintal to Rs. 4000 per quintal.

ii) In overall level, an arrival of red gram was decreased by 3.38 per cent and a price was increased by 3.26 per cent and in case of gram, an arrival was increased by 1.31 per cent and prices were increased by 9.22 per cent at overall level.

iii) In case of red gram ,the price index for the month of December was highest 109.57 per cent followed by November 103.79 per cent and for gram the price index for the month of October was highest 113.86 per cent followed by December 106.55 per cent.

iv) In case of prices the Co- efficient of variation ranges from 29.41 to 34.26 per cent, this clearly indicates that there was a less variation in the prices of the red gram crop. In case of prices of gram crop, Co-efficient of variation ranges from 32.74 per cent to 40.91 per cent, this clearly indicates that there is less variation in the prices of the gram crop.

v) The correlation coefficients of both crops were negative during the whole year indicating that increased arrivals resulted into decreased in prices; in this case the phenomenon of inverse relationship is proved.

vi) The maximum variation in arrivals of red gram was found in the month of November (1182.95 quintals) followed by September (758.46 quintals) and October (646.60 quintals) and the maximum variation in arrivals of gram was found in the month of December which was 330.61 per cent followed by November (287.55 per cent).

vii) In case of Polynomial trend line for red gram and gram crop from the year 2009 to 2018 the order 2 polynomial trend line has been found it clearly indicates that there is only one hill found in the sample.

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Suggestions

The less arrivals of red gram and gram were observed during the months of April to November and September to December, respectively. Therefore, farmers are advised to schedule the sell of red gram and gram in Ahmednagar APMC during the above period to get the better prices for the produce.

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