Research Article

PATTERN OF MARKET ARRIVALS AND PRICES OF GRAM IN RAJASTHAN

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Abstract- The present study was undertaken for the analysis of behaviour of market arrivals and prices of Gram in Rajasthan. In Jaipur market, the arrivals in the peak period were the maximum during the last 10 years. These were in the range of about 9.49 (2012-13) to 94.41 per cent (2007-08) of the total arrivals and the least in the lean period, ranging between 2.92 per cent (2007-08) to 89.41 per cent (2012-13). In Kishangarh market, the arrivals of gram followed more or less the same pattern as in Jaipur. In Chomu market, and in Malpura market, the arrivals in peak period were maximum followed by mid-period and lean period. The seasonal indices analysis of arrivals and prices revealed that when major portion of the produce was received in the market, the prices were at the lowest . There was a negative correlation between prices and arrivals in Chomu (non-significant) market. However, in Jaipur, and Malpura market, the correlation between arrivals and prices was positive but non-significant. But in Kishangarh market, it was positive and significant which may be due to higher demand for gram due to differences in food habits. The increasing trend in arrivals in Jaipur, Kishangarh and Malpura markets which was significant except Jaipur market. However, the trend in arrivals of gram in Chomu market showed decreasing and significant.

Keywords- Trend, Integration, Seasonal Variation, Market, Gram.

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Introduction

Gram serves as food in many ways. Gram soup has good food value and that it helps in the recovery from spleen and liver disorders. Many attractive dishes *viz.* - sweets, snacks and namkeen are also prepared from its flour called besan. It is also eaten as fried or boiled and salted. India is the largest producer and consumer of pulses in the world. Pulses are grown on an average of about 23 million ha area in India. Over the years, pulses cultivation in India has been pushed to marginal lands and rainfed areas. The major area under pulses lies in Madhya Pradesh (20%), Maharashtra (14%), Rajasthan (17%), Uttar Pradesh (10%), Karnataka (9%), Andhra Pradesh (8%), Chhattisgarh (4%), Bihar (3%) and Tamil Nadu (3%). These states contribute 80% of total pulse production. Agriculture in Rajasthan state is primarily rainfed. The period of monsoon is short, around three months. In Rajasthan, pulses occupied 4197.72 thousand hectares and production was 2471.10 thousand tonnes in 2013-14 (www.rajasthankrishi.gov.in). These are mainly cultivated in arid and semi-arid districts including Nagaur, Jaipur, Jodhpur, Sikar, Pali, Jhunjhunu and Ajmer. Wide fluctuations have been observed in both area and production of pulse crops in Rajasthan mainly due to change in weather and climatic conditions. It is observed that during the years with favourable weather conditions, pulse production increases to double of the average production. Markets are glutted and prices of pulses slump down. In order to device the appropriate ways and means for not only reducing the degree of fluctuations in the prices of agricultural products but also increasing the quantity of market arrivals, there is need to have a perfect understanding about the behaviour of prices of different agricultural products over a period of time. There was a high degree of variability from year to year in prices

and arrivals, which meant that a farmer or a trader could not be assured of profits from storage every year [1]. Marketing plays an important role in the economic development as it stimulates production, avoids unnecessary fluctuation in output and prices. The past trends in market arrivals of commodities are also useful in understanding the present and to forecast the future. Prices play a vital role in predominantly agricultural economies like India. However, one way to throw some light on this issue is to analyze the market performance by studying market integration [2]. The degree to which consumers and producers would benefit depends on how domestic markets are integrated with world markets and how different regional markets are integrated with each other [3].

Methodology

For the present study, Jaipur, Kishangarh, Chomu, and Malpura markets of Rajasthan were selected. Secondary data in respect of arrivals in different markets and wholesale prices of Gram prevailing in these markets were obtained from Directorate of Economics and Statistics, Government of Rajasthan, Jaipur. The relationship between prices in different markets has been studied using simple correlation [4]. To study the relationship between market arrivals and wholesale prices of Gram in the selected markets, simple correlation coefficient was worked out using the following formula:

$$r = \frac{\sum \left(x_i - \bar{x}\right) \left(y_i - \bar{y}\right)}{\sqrt{\sum \left(x_i - \bar{x}\right)^2 . \sum \left(y_i - \bar{y}\right)^2}}$$

Where,

r = Simple correlation coefficient between arrivals and prices of Gram.

X_i = Quantity of arrivals of Gram in i^{th} month/year (quintals)

$\overline{X_i}$ = Average quantity of arrivals of Gram (quintals)

Y_i = Price of Gram in i^{th} month/year (Rs/qtl)

$\overline{Y}$ = Average price of Gram (Rs/qtl)

n = Number of observations

Market integration

Market integration was studied by zero order correlation matrix approach using correlations between prices of Gram crops in primary wholesale markets, secondary wholesale markets, and terminal wholesale market in the state. Although several studies have been done empirically using integration techniques which concern the market integration of agricultural commodities in India [5-15], only a little work has been carried out on the empirical evaluation of gram market integration.

Trend Analysis

To work out seasonal effects in prices, linear trend method was used. Linear trend method is described as under;

$$P_t = a + b\,T_t + U_t \quad\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots[i]$$

Where;

P_t = price during the year.

T_t = serial no. assigned to the tth year.

U_t = random disturbance term.

Seasonal fluctuations were calculated by eliminating trend, cyclic and irregular fluctuations. The seasonal indices were calculated by the formula given as under;

$$O = \frac{T.\,C.\,S.\,I.}{T.\,C.\,I.} \quad\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots[ii]$$

Where;

O = Original data on monthly gram arrival and prices.

T = Secular trend

S = Seasonal variation

I = Irregular fluctuations

C = Cyclical fluctuations

Results

With a view to examining the marketing pattern of gram, the crop year was split up into three periods *viz.,* (i) Peak marketing period (April to July) when majority of producers, especially the small farmers sell their produce, (ii) Mid marketing period (August to November) when producers of average financial position sell because they cannot withhold their produce any longer and (iii) Lean marketing period (December to March) when the producers of only sound financial position sell their produce. [Table-1] indicates that in Jaipur market, the arrivals in the peak period were the maximum during the last 10 years (2004-05 to 2013-14). These were in the range of about 9.49 (2012-13) to 94.41 per cent (2007-08) of the total arrivals and the least in the lean period, ranging between 2.92 per cent (2007-08) to 89.41 per cent (2012-13). The prices in peak period were lower than that of lean period.

In Kishangarh market, [Table-2] the peak period arrivals were in the range of 32.10 to 92.97 per cent. In the mid period, it ranged from 1.26 to 14.36 per cent and in the lean period, the arrivals were in the range of 2.97 to 66.64 per cent. The similar trend was observed in prices, which were higher in lean period and lower in mid and peak period.

In Chomu market, [Table-3] the peak period arrivals were in the range of 47.49 to 92.67 per cent. In the mid period, it ranged from 2.90 to 20.89 per cent and in the lean period, the arrivals were in the range of 3.40 to 33.06 per cent. The prices in Chomu market followed the same trend as in Jaipur and Kishangarh market.

In Malpura market, [Table-4] the peak period arrivals were in the range of 40.37 to 90.13 per cent. In the mid period, it ranged from 3.34 to 12.55 per cent and in the lean period, the arrivals were in the range of 4.67 to 56.19 per cent. The prices, in general were higher in lean period as compared to mid and peak periods. The patterns of arrivals were almost the same in all the markets. The maximum arrivals were in the peak period followed by mid period and lean period. In most of the years, the prices were lower in the peak and mid periods than that of lean period barring few exceptions.

Table-1 *Per cent arrivals and prices (Rs/Qtl.) of Gram in Jaipur market*

Year	Arrivals in Peak Period (April-July)	Price (Rs/Qtl.)	Arrivals in Mid Period (August-November)	Price (Rs/Qtl.)	Arrivals in lean Period (December-March)	Price (Rs/Qtl.)
2004-05	65.72	390.19	1.89	394.92	32.39	414.81
2005-06	59.33	389.68	2.54	399.17	38.13	411.64
2006-07	67.52	391.63	1.43	398.44	31.05	409.87
2007-08	94.41	396.28	2.67	401.66	2.92	402.55
2008-09	86.55	394.65	2.66	397.92	10.79	407.51
2009-10	81.18	393.57	11.75	395.69	7.07	410.88
2010-11	45.18	384.42	2.92	401.95	51.90	413.95
2011-12	77.88	391.83	10.09	402.52	12.03	406.18
2012-13	9.49	392.06	1.10	401.39	89.41	406.47
2013-14	26.79	387.32	3.79	402.41	69.42	410.46

Table-2 *Per cent arrivals and prices (Rs/Qtl.) of Gram in Kishangarh market*

Year	Arrivals in Peak Period (April-July)	Price (Rs/Qtl.)	Arrivals in Mid Period (August-November)	Price (Rs/Qtl.)	Arrivals in lean Period (December-March)	Price (Rs/Qtl.)
2004-05	69.28	394.63	4.22	401.28	26.50	404.60
2005-06	74.70	398.76	7.40	399.17	17.90	402.18
2006-07	78.00	395.49	13.25	400.09	8.75	404.54
2007-08	92.97	394.85	4.06	398.52	2.97	406.61
2008-09	75.52	392.72	10.39	401.17	14.09	406.15
2009-10	73.44	385.95	14.36	398.19	12.20	415.90
2010-11	43.65	393.68	6.19	400.89	50.16	405.57
2011-12	42.50	395.85	6.15	401.09	51.35	403.49
2012-13	32.10	393.42	1.26	400.19	66.64	406.39
2013-14	35.54	385.32	5.94	393.36	58.52	421.39

Table-3 *Per cent arrivals and prices (Rs/Qtl.) of Gram in Chomu market*

Year	Arrivals in Peak Period (April-July)	Price (Rs/Qtl.)	Arrivals in Mid Period (August-November)	Price (Rs/Qtl.)	Arrivals in lean Period (December-March)	Price (Rs/Qtl.)
2004-05	66.54	396.33	6.28	399.50	27.18	404.15
2005-06	80.10	395.02	2.90	401.74	17.00	403.23
2006-07	90.44	395.61	5.38	397.24	4.18	407.19
2007-08	92.67	394.08	3.93	398.76	3.40	407.14
2008-09	80.55	399.25	3.98	399.50	15.47	401.48
2009-10	71.72	389.52	16.64	399.76	11.64	410.71
2010-11	47.49	392.46	20.89	401.51	31.62	406.28
2011-12	78.05	393.42	14.06	402.19	7.89	404.39
2012-13	59.41	392.83	7.53	399.46	33.06	407.96
2013-14	53.82	389.41	18.41	397.00	27.77	413.71

Table-4 *Per cent arrivals and prices (Rs/Qtl.) of Gram in Malpura market*

Year	Arrivals in Peak Period (April-July)	Price (Rs/Qtl.)	Arrivals in Mid Period (August-November)	Price (Rs/Qtl.)	Arrivals in lean Period (December-March)	Price (Rs/Qtl.)
2004-05	74.54	394.24	3.69	395.66	21.77	410.45
2005-06	71.34	381.70	3.34	405.11	25.32	413.23
2006-07	40.37	393.53	3.44	402.76	56.19	403.81
2007-08	82.08	391.66	10.62	402.61	7.30	405.90
2008-09	81.91	399.12	3.54	400.05	14.55	400.98
2009-10	73.59	394.35	12.55	400.19	13.86	405.35
2010-11	90.13	395.50	5.20	401.11	4.67	403.74
2011-12	53.37	394.40	4.86	400.18	41.77	405.69
2012-13	46.54	383.68	4.58	395.16	48.88	421.17
2013-14	40.63	383.05	3.63	393.75	55.74	423.50

Seasonal Variations in Arrivals of Gram in Selected Markets

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A number of studies have been examined the seasonal variation in arrivals and prices of Agricultural commodities in India [16-20]. In order to ascertain the long run seasonal variation in the arrivals of gram in the selected markets, seasonal indices for arrivals were calculated. The seasonal indices of monthly arrivals of gram in the selected markets are presented in [Table-5]. The results clearly indicate the existence of seasonality in arrivals of gram in all the markets. Highest arrivals of gram in Jaipur market were observed during the peak period. The higher market arrival indices (more than 100) in Jaipur market were observed during the months of March to June, the highest being observed in month of March (530.97). The range of arrivals indices varied between 5.39 to 530.97. Arrival indices reached the peak during March (535.94) in Kishangarh market and decreased to 9.55 in December. Highest arrivals of gram in Chomu market were observed during the month of April (371.65). The range of arrival indices was 11.74 to 371.65 during different months of the year. Arrival indices reached the peak during April (483.11) in Malpura market and decreased to 9.33 in January.

Table-5 *Seasonal indices of arrivals of Gram in different markets (Per cent)*

| Month	Markets			
	Jaipur	Kishangarh	Chomu	Malpura
January	7.71	11.99	11.74	9.33
February	7.83	15.81	19.61	10.21
March	530.97	535.94	219.62	366.91
April	339.05	377.54	371.65	483.11
May	134.81	76.73	142.68	176.57
June	68.11	49.03	113.66	51.65
July	37.16	42.05	117.17	18.88
August	20.62	16.09	41.35	20.76
September	23.70	32.17	60.31	24.22
October	15.49	14.78	34.59	12.14
November	11.59	18.72	40.18	16.87
December	5.39	9.55	17.80	9.37
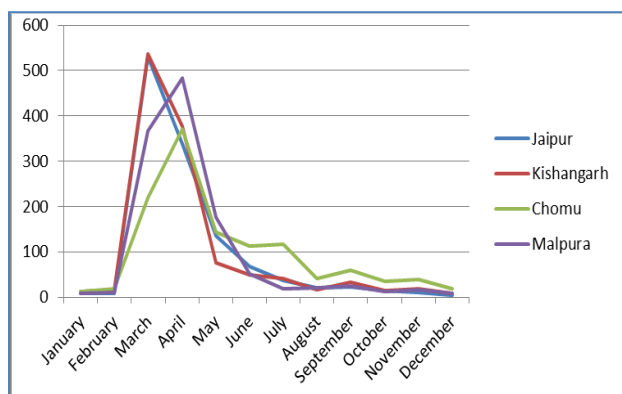
Fig-1 Seasonal Indices of Arrivals of Gram in Different Markets (Percent)

Seasonal Variations in Prices of Gram in Selected Market

The seasonal indices of pulse crops in Rajasthan have been worked out. The data on wholesale as well as farm harvest prices of all the pulse crops were collected during the period of 1972-1987. The results indicated that price indices were the lowest during peak arrival months (April-May months for gram and October-November months for moth, moong and urad pulse crops) and highest during sowing season months of the crop (October-November for gram and June-July for moth, moong and urad). Arhar (long duration kharif pulse crop) depicted minimum prices during January-February months and maximum in the month of October [16]. In order to analyse the long run seasonal variations in the prices of gram in the selected markets, seasonal indices for prices were computed. The seasonal indices of monthly prices of gram in the selected markets are presented in [Table-6]. The higher seasonal price indices observed in Jaipur market were in the months of December, January, February and March with values of 103.56, 102.06, 102.21 and 102.19, respectively. Lower seasonal price indices were observed during the months of April (96.81). Kishangarh market witnessed the highest seasonal price index during December (103.12). Chomu market witnessed the highest seasonal price index in January (102.52). The higher seasonal price

indices in Malpura market were in the months of December, January, February and March with values of 101.10, 104.87, 103.61 and 101.84, respectively. The lower seasonal price index was observed during the month of May (96.13). The variation in the price of gram in the peak season and lean season in the selected markets does not appear to be significantly higher because gram is grown under rainfed conditions. The farmers are not sure of next harvest because of climatic reasons. Therefore, they retain gram till they get the next harvest of gram.

Table-6 *Seasonal indices of Prices of Gram in different markets (Per cent)*

| Month	Markets			
	Jaipur	Kishangarh	Chomu	Malpura
January	102.06	103.03	102.52	104.87
February	102.21	102.61	102.22	103.61
March	102.19	101.84	102.29	101.84
April	96.81	97.29	97.37	97.16
May	97.93	98.29	97.15	96.13
June	97.46	97.45	98.65	98.00
July	97.57	97.77	98.32	99.06
August	100.39	99.32	99.69	99.43
September	100.54	99.92	100.08	99.58
October	100.33	99.39	99.73	99.57
November	99.46	100.05	100.43	99.66
December	103.56	103.12	101.54	101.10
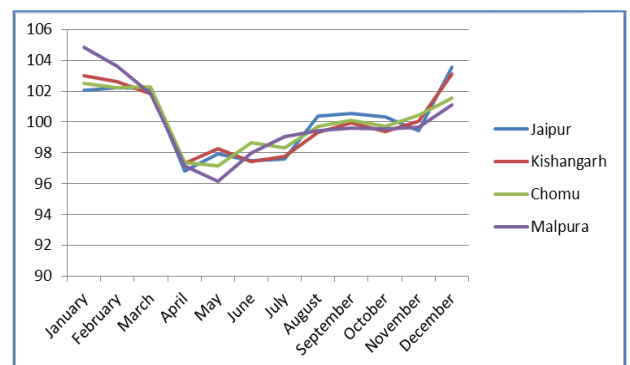
Fig-2 Seasonal Indices of Pricess of Gram in Different Markets (Percent)

Relationship between Market Arrivals and Prices

The degree of relationship between market arrivals and prices of gram was studied by computing correlation coefficients. The results of correlation analysis, given in [Table-7], reveal a negative correlation between prices and arrivals in Chomu (non-significant) market. However, in Jaipur, and Malpura market, the correlation between arrivals and prices was positive but non-significant. But in Kishangarh market, it was positive and significant at 5 per cent level of significance which may be due to higher demand for gram due to differences in food habits.

Table-7 *Prices and Arrivals Correlation of Gram in the selected Markets*

Market	Correlation
Jaipur	0.551[NS]
Kishangarh	0.637[**]
Chomu	-0.429[NS]
Malpura	0.550[NS]

**significant at 5 per cent level of significance

Trends in Arrivals and Prices of Gram in the Selected Market

Several studies have been done empirically using linear trend techniques which concern the market trend of agricultural commodities in India [21-24], only a little work has been carried out on the empirical evaluation of gram market trend. Trend analysis of arrivals of gram in Jaipur, Kishangarh, Chomu and Malpura markets is presented in [Table-8]. The table reveals the increasing trend in arrivals in Jaipur, Kishangarh and Malpura markets which was significant except Jaipur market. However, the trend in arrivals of gram in Chomu market showed decreasing and significant.

Table-8 *Trend in Gram arrivals*

Name of the market	Period	Equation fitted	F value	R^2
Jaipur	2004-05 to 2013-14	P= 67.56+10.03t^{NS}	2.43	0.23
Kishangarh	2004-05 to 2013-14	P=-1328.5+466.20t*	14.94	0.65
Chomu	2004-05 to 2013-14	P= 81.21-6.56t**	8.99	0.53
Malpura	2004-05 to 2013-14	P= -193.82+90.38t**	7.91	0.50

*significant at 1 per cent level of significance
**significant at 5 per cent level of significance

The price trend equations were worked out for these markets and these equations are given in [Table-9]. The table reveals that trend values of prices in all market were positive and significant at 1 per cent level of significance except Kishangarh market where it was significant at 5 per cent level of significance. The co-efficient of multiple determinations (R^2) indicated that 45 to 68 percent variation in gram price was due to time factor.

Table-9 *Trends in Gram Prices*

Name of the market	Period	Equation fitted	F value	R^2
Jaipur	2004-05 to 2013-14	P=98.79+12.88t*	16.88	0.68
Kishangarh	2004-05 to 2013-14	P= 97.26+7.09t**	6.56	0.45
Chomu	2004-05 to 2013-14	P= 90.68+12.05t*	14.31	0.64
Malpura	2004-05 to 2013-14	P= 86.04+13.58t*	15.61	0.66

*significant at 1 per cent level of significance
**significant at 5 per cent level of significance

Market Integration

Market integration implies the relationship among the spatially separated markets. Markets differ in the extent of integration and, therefore, there may be a variation in their degree of efficiency. The extent by which prices of a commodity move together over a period of time in different markets located at varied distances from each other is an indicator of market integration for the commodity. In integrated marketing system, price of a commodity in one market is responsive to price change in another market and as such, price differences between the markets should not exceed the transportation and handling costs. The analysis of movement in prices of a commodity in different markets helps in ascertaining as to what extent the marketing system is efficient in respect of that commodity. The market integration was studied by making zero order correlation matrix. The correlation between prices of gram in different markets was studied and is presented in [Table-10]. The table reveals that prices of gram in Jaipur market were highly integrated with Chomu, Malpura and Kishangarh. Kishangarh market was highly integrated with Chomu and Malpura. Overall, all markets which were spatially separated show higher degree of market integration.

Table-10 *Correlation between prices of Gram in different markets*

Market	Jaipur	Kishangarh	Chomu	Malpura
Jaipur	1.00	0.800**	0.868*	0.856*
Kishangarh		1.00	0.970*	0.938*
Chomu			1.00	0.992*
Malpura				1.00

*Significant at 1per cent level of significance.
**Significant at 5 per cent level of significance.

Conclusion and Recommendation

There are wide price fluctuations in gram crop. The MSP needs to be linked to market prices, and there should be a mechanism to provide stable prices to protect farmers from high year-to-year price fluctuations. Farmers sell their marketed surplus immediately after harvest, while some big wholesalers hoard pulses to take advantage of speculative gains in the off-season. Due to this, farmers do not benefit from the higher market prices of pulses. Investments in market infrastructure, warehouses, and market information systems need to be increased for achieving higher marketing efficiency.

The study also reveals that during peak period, the prices of gram are depressed. Therefore, government should enhance efforts in procurement of gram at MSP in the peak period. Farmers should also avail warehouse receipt loans which is up to 75 per cent of the value of the produce so that they can get remunerative price during mid-period and lean period. Credit facilities should also be availed by medium and large farmers under Gramin Bhandaran Yojana (Rural Warehousing Scheme) to have scientific storage facilities at village level to improve their holding capacity.

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