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Price volatility of guar in Haryana

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Abstract

Guar is a highly traded commodity and prone to price fluctuations. Guar (*Cyamopsis tetragonoloba*) is a drought tolerant, multi-purpose legume crop cultivated mainly in the kharif season in arid environment. India is the largest producer (80%) and exporter of guar in the world. In India, Rajasthan (90%), Gujarat (5%), and Haryana (4%) are the highest producing states of guar. Volatility is the variability of commodity prices around the trend, while wide price movements over a short period of time typify the term high volatility. This study focuses on the extent of volatility in prices of guar at macro level whether an institutional support such as a futures trading could be a solution to the problem of price volatility. The study shows that the inter-annual volatility indices (Parkinson's index) for guar prices remain same for all the markets except in the year 2012, and 2013. And this was due to government intervention in year 2012 as FMC banned futures trading in India. Coefficient of variation indicated high instability in all the markets under study. Out of these markets Bhattu Kalan market faces highest instability (CV of 88.26%). Coppock's instability index show highest instability in Bhattu Kalan market (CII of 69.62%). These fluctuating prices increases the uncertainty faced by the farmers in their planting decisions and in earning reasonable as well as stable returns. The study also analyzed the effect of futures trading on the prices of guar. The study also shows that the price of guar is also depending on the arrival of produce in the markets (supply) when year 2012 and 2013 were excluded. Some of the suggestions for the government are 'Single Vision Strategy', introduction of drought resistant varieties and subsidies for rainwater harvesting structure. On the other hand, farmers should make themselves well informed about market intelligence and futures trading.

Keywords: Price volatility, guar, instability, inter-annual volatility, Coppock's instability index

Introduction

Guar, also known as the cluster bean (*Cyamopsis tetragonoloba*), is one of the important leguminous crops cultivated in South Asia, especially in India. It is a multi-purpose crop which can be used as animal feed, vegetable, green manure and for extraction of gum for various industrial uses. Guar gum is used in many different industries, including food processing, oil and gas, paper, textile, cosmetics, mining, and explosives (Bhupender and Kumar. 2020) ^[4]. As guar is drought-tolerant legume crop which make it suitable for arid and semi-arid climates of India and India is the largest producer of guar with a production of 1519.30 thousand metric tonnes (Directorate of Economics and Statistics, 2023) ^[8] and contributes about 80 percent of the world's guar production (Dhaka *et al.* 2019) ^[7]. Guar cultivation in India is mostly concentrated in Rajasthan, Gujarat and Haryana, accounting for about 99 percent of the guar cultivated in the country. In 2018-19, guar had a contribution of about USD million 676 to the country's total value of export. In the global community, USA is the biggest importer of guar from India, followed by Germany and Russia during the last five year (APEDA, 2022-23) ^[2].

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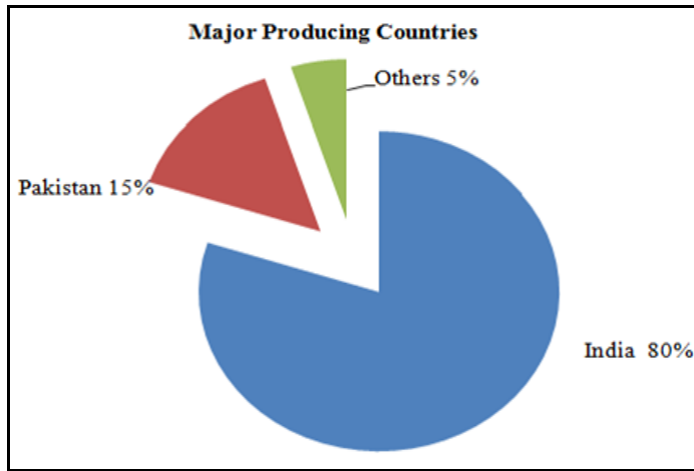
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Source: National Rainfed Area Authority (NRAA) 2014

Fig 1: Major producers of guar seed in the world (2014)

Guar is the multi-purpose legume crop grown in Haryana. The term guar has been evolved from its most common use in India as cattle-feed “*Gowahaar* (Gow means cow and Ahaar means feed)” (Rai, 2015) [13]. In the year 2019-20, area under guar cultivation in Haryana is 136.81 thousand ha with production of 120.85 thousand metric tonnes. It occupies a share of 4.45 percent in the gross cropped area of Haryana, but, the state’s share in the total area and production has declined over the years in India. In 2013-14, 8.1 percent of the country’s guar area and 10.3 percent of guar production were in Haryana, which reduced to 4.3 and 7.9 percent, respectively, in year 2019-20 (Department of Agriculture and Farmers Welfare, Haryana, 2023; Directorate of Economics and Statistics, 2023) [6, 8]. And the main reasons behind this fall were: uncertainty in monsoon arrival date, monsoon rainfall pattern and intensity and price volatility.

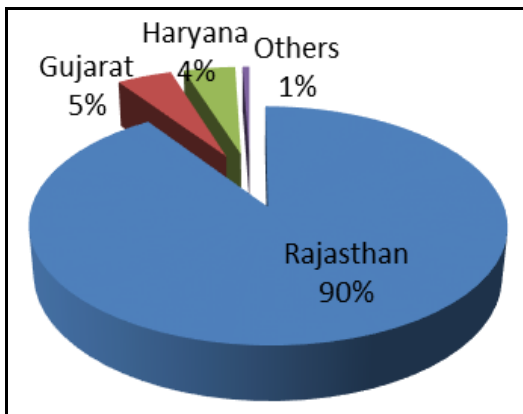


Fig 2: Major guar producing states in India (2019)

The fluctuation in guar prices is one of the reasons behind the alarming fall in production and area of guar in Haryana. Guar as an export-oriented commodity has always been associated with price fluctuations, which are caused by several factors like dynamics in domestic and international production (supply) and consumption (demand), international prices, exchange rates, trade agreements and export-import policies (Sabu and Kuruvila, 2016) [15]. Guar’s demand soared with the expansion of the shale oil and gas industry, and the value of guar gum exports to the United States rose to nearly a billion USD dollars in 2011, further to \$3.4 billion in 2012 and then came down to \$1.6 billion in 2013 (Singh, 2014) [20]. Due to which, guar’s prices had set on fire in 2012.

Consistency in prices of any commodity plays a huge role in increasing the production of that commodity. Unexpected price volatility creates problems for farmers and on the other hand it also affects the government by complicating budgetary plans. With this background, the study has assessed the extent of volatility in the prices of guar in Haryana and explores whether an institutional support such as a contract agreement could be a solution to the problem of price volatility and to ensure livelihood security of the farm households (Sabu *et al.*, 2020) [14]. The findings of the study could help in identifying the differential impact of price volatility on the area and production of guar and for formulating suitable price stabilization policies.

Materials and Methodology

The study pertains to Haryana state of India. The present study is based on the secondary data. The markets considered for the study are Bhattu Kalan (Fatehabad), Ellenabad (Sirsa), Fatehabad (Fatehabad), and Narnaul (Mahendergarh). The time series data on annual prices were collected for 14 years, i.e., from 2006 to 2019 from Directorate of Marketing and Inspection (DMI) website (agmarknet.gov.in) to find out the price volatility of guar.

Inter-Annual Volatility

Inter-year volatility captures variations in prices between years which have crucial bearing on the long term planning of the sector. The inter-annual volatility measure or the scaled inter-annual range called as the Parkinson’s measure as suggested by Parkinson (1980) [23] and modified by Garman and Klass (1980) [24] and Kunitomo (1992) [25] was used to estimate the inter-annual volatility of monthly prices.

Parkinson’s measure is defined as $S_y^P = \frac{\ln P_y^H - \ln P_y^L}{2\sqrt{\ln 2}}$

Where, P_y^H is the highest monthly average price in the year and P_y^L is the lowest monthly average price in the year.

Coppock’s Instability Index (CII)

The annual instability in prices of guar was measured using Coppock’s Instability Index (CII). Trend free measure of variability which is a close approximation of the average year to year percentage variation adjusted by trend (Kaur and Singhal, 1988) [11]. CII was calculated as the antilog of the square root of the logarithmic variance using the following formula (Coppock, 1966) [5]

$CII = \text{Antilog} \sqrt{(V \log - 1)} \times 100$

Where $V \log = \frac{1}{(N-1)} \sum (\log P_{t+1} - \log P_t - M)^2$

$M = \frac{1}{(N-1)} \sum (\log P_{t+1} - \log P_t)$

N=Number of years

P=Annual price of guar

M=Arithmetic means of the differences between logs of

P_t and P_{t+1} , P_{t+1} and P_{t+2} etc.

Vlog = Logarithmic variance of the price series.

Coefficient of variation

To estimate the price fluctuations of guar for the study period, coefficient of variation has been used. The coefficient of variation (CV) is defined as the ratio of the standard deviation (SD) to the mean.

$$CV(\%) = \frac{SD}{Mean} \times 100$$

Results and Discussion

The result and discussion section is divided into two subsections:

1. Volatility in price of guar

2. Instability in price of guar

a. Volatility in price of guar

The magnitude of inter-annual volatility in guar price measures dispersion between two successive years. It specifies the struggle of producers to make returns over the fluctuating price, in turn resulting in poor crop management and lower replanting. The inter-annual volatility indices of monthly guar prices from 2006 to 2019 are plotted in Figure 3. In the given study period, the inter-annual volatility indices for all markets were closer throughout, except for year 2011 and 2012. In year 2011 and 2012, all markets diverged but Bhattu Kalan market show very high divergence along with Haryana as whole.

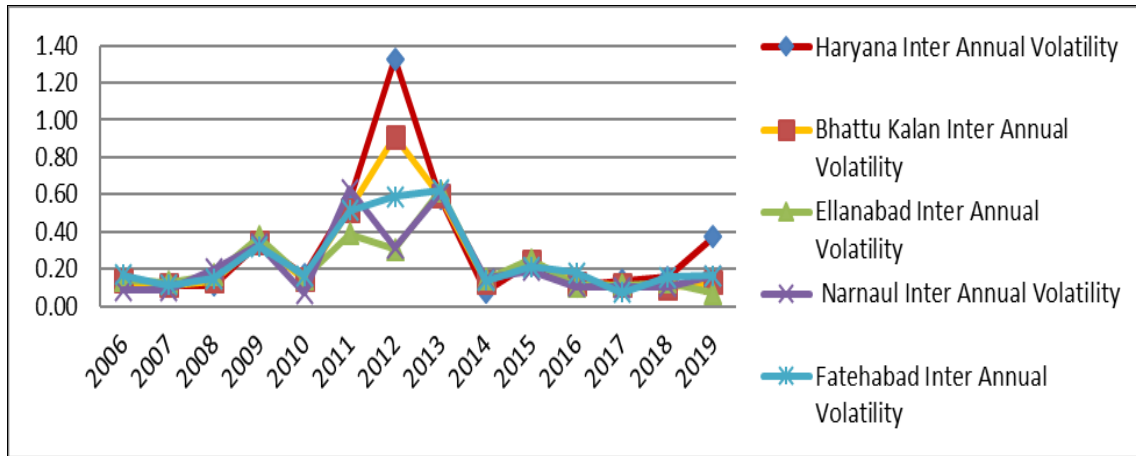


Fig 3: Inter-annual volatility indices of monthly prices of guar

The peak price of guar was ₹24528/qt and ₹28803/qt in the month of March and April 2012, respectively. The reason behind such type of extreme volatility was that, the demand for fast hydrated gum for fracking purpose in the shale gas industry touched new heights. This resulted in a rise in the prices of guar products (Rai, 2015) [13]. As maximum trading for guar was done in NCDEX (National Commodity & Derivative Exchange Ltd) and it deals in futures trading of guar. Thus, due to futures trading big companies cashed on this opportunity and made windfall gains by trading in NCDEX (this was due to increase in international demand for guar gum however, farmers were not aware of it).[Sood, 2012] [21]. On account of this, FMC (Forward Markets Commission) banned futures trading in guar gum and seed on March 2012 after prices zoomed by 1,000 percent (₹95,920/qt) and 950 percent (₹29,900/qt) respectively to stabilize the market (Sally, 2012) [16]. After imposing ban on futures trading in 2012, guar prices in Haryana had slumped in May 2012 itself upto ₹3142/qt. Due to which farmers instead of selling their produce, they stocked it as anticipation for better prices of guar. As a result supply decreased, and once again price of guar saw a hike of ₹11934/qt and ₹11522/qt in December 2012 and January 2013 respectively. Other factors responsible for the price volatility in guar is higher fluctuation in area and production which depends on arrival, spread and level of monsoon rainfall in guar producing area, along with its supply and export demand of guar gum also plays crucial role (Sindhuja *et al.*, 2022) [18].

b. Instability in price of guar

a) Coefficient of variation

Prices of guar in all four selected markets show very high variation along with Haryana as whole (wholesale price of guar in case of Haryana). Out of these four markets, Bhattu Kalan

market show highest coefficient of variation of 88.26 percent and Ellenabad market showed lowest variation of 57.26 percent. The coefficient of variation of whole Haryana is 72.50 percent.

Table 1: Coefficient of variation for guar prices from 2006-2019

Market	Mean	SD	CV
Bhattu Kalan	4263.86	3763.41	88.26
Fatehabad	3891.29	2863.59	73.59
Narnaul	3755.73	2304.73	61.37
Ellenabad	3664.93	2109.68	57.56
Haryana	3985.20	2889.40	72.50

Note: SD (Standard deviation) and CV (Coefficient of variation) After analyzing the coefficient of variation of entire study period we then divide the whole study period into three intervals of 2006-2010, 2011-2014 and 2015-2019, the results are depicted in following table:

Table 2: Coefficient of variation (%) for guar prices over different intervals

Markets → Interval	Bhattu Kalan	Fatehabad	Narnaul	Ellenabad	Haryana
2006-2010	14.19	14.34	13.61	12.86	14.01
2011-2014	69.60	38.51	43.68	56.00	53.19
2015-2019	9.43	9.90	12.14	10.74	8.92

From Table 2 we can see that, maximum coefficient of variation in the interval 2011-2014 was observed in Bhattu Kalan market at 69.60 percent and minimum in Fatehabad market at 38.51 percent. Both the maximum and minimum values of CV (%) are in the high variation range over the period 2011–2014. On the other hand, during the period 2006-2010 and 2015-2019, the

coefficient of variation in all markets is below 15 percent which signifies normal variation category. This means that the main variation in guar prices was observed in the period 2011-2014. The main reason behind such high variation was the sudden increase in demand for guar in the international market, especially the US market, in 2012, which resulted in a rise of prices of guar during the year 2012.

b) Coppock's Instability Index (CII)

The range of fluctuations in guar prices over a year was calculated using Coppock's volatility index. CII measure of instability provides close approximation of the average year to year percent variation (Singh *et al.*, 2021) [19]. Instability estimates across all markets show that Bhattu Kalan market (69.62%) witnessed the highest instability, followed by Fatehabad market (66.71%). The study also reveals that of all the markets under study, Ellenabad market shows the lowest instability with CII of 62.89 percent. Haryana as a whole shows CII of 66.52 percent.

Table 3: Coppock's instability indices for guar's prices from 2006-2019

Market	Vlog	CII (%)
Bhattu Kalan	0.41	69.62
Fatehabad	0.35	66.71
Narnaul	0.32	64.72
Ellenabad	0.29	62.89
Haryana	0.35	66.52

Note: Vlog (Logarithmic variance if the price series) and CII (Coppock's Instability Index)

After analyzing the Coppock's Instability Index of entire period, the whole study period is then divided into three intervals of 2006-2010, 2011-2014 and 2015-2019. The results of these intervals are shown in table 4.

Table 4: Coppock's instability indices for guar's prices over different intervals

Markets → Interval	Bhattu Kalan	Fatehabad	Narnaul	Ellenabad	Haryana
2006-2010	42.13	41.63	41.83	42.16	42.06
2011-2014	69.97	63.69	58.55	53.98	61.89
2015-2019	40.56	41.10	41.63	40.74	40.33

The result from these intervals showed that maximum volatility was observed in all markets with CII value above 50 percent during the interval 2011-2014, with Bhattu Kalan market showing maximum volatility (CII 69.97%) and Ellenabad market showed minimum volatility (CII 53.89%). Whereas, in the remaining two intervals i.e. 2006-2010 and 2015-2019, the value of CII for Haryana state and all four markets remained only around 40 percent, which means in these intervals instability was there but in less amount compared to interval 2011-2014.

Suggestions

In Indian agricultural export, guar has captured one of the most important places, and is now an important alternative commercial crop for farmers in the dry region of the country. Looking at the agricultural and industrial importance of this marginalized crop, an attempt has been made to prepare a road map for the overall development of guar production, marketing and processing industry, aligning the views of all the stakeholders in the value chain in the form of single vision

strategy. Single vision unites all the parts of the value chain and links the supporting pillars to maximize benefits to all the participants in the industry. "Single Vision Grains Australia" (SVGA) was an initiative designed to unify the Australian grains industry and enhance its competitiveness on a global scale. The aim was to create a cohesive and vibrant industry that could navigate the complexities of the international market while maximizing benefits for all participants in the grains value chain (Sharma *et al.*, 2012) [17]. The various initiatives like investment in research and development for the evolution of drought-resistant varieties to reduce dependency on monsoon rain, subsidies for rainwater harvesting structures should be provided (Swamy *et al.*, 2015) [22]. Farmers should be aware about timely market intelligence which aids the farmers in making suitable decisions like time of harvest, period of storage, place of sales and value addition, thus overcoming the implications of price fluctuations in guar (George *et al.*, 2023) [9]. Future trading in guar is one of the good options for farmers to avoid the price volatility. Since guar crop can be stored for two years, farmers should be provided with affordable storage facilities so that they can store their produce until better prices prevail in the market.

Conclusions

The findings of the present study observed that inter annual volatility indices for all markets were closer throughout the period under study, except for year 2011 and 2012. In the year 2011 and 2012 all markets were diverged but Bhattu Kalan market and state of Haryana showed high diversions. All the four selected as well as Haryana as a whole showed very high coefficient of variation in price. Maximum CV was observed in Bhattu Kalan market (88.26%) and lowest CV was observed in Ellenabad market (57.56%). However, when data was analysed according to three different intervals i.e. 2006-2010, 2011-2014 and 2015-2019, the results revealed that the main variation in price was seen in interval 2011-2014 with highest coefficient of variation in all the markets under study as well as state of Haryana. While in other intervals coefficient of variation remains below 15 percent, which means prices does not show much variation in those intervals. Similarly in case of Coppock's Instability Index, the value of CII vary between 60 percent to 70 percent in Haryana state and all markets under study. This shows that all markets have high instability with maximum instability in Bhattu Kalan market. The results of CII (%) of the three different intervals, reveals that only 2011-2014 interval show high instability with above 53 percent CII for all markets under study. Thus it is concluded that the main reason for such extreme price volatility during the study period is due to drastic increase in international demand in 2012. In other years, prices are volatile however not to the extreme amount. The main reasons for remaining year's price volatility are area and production of guar, arrival of produce in market, onset date of monsoon and rainfall pattern and its intensity.

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