# AGRICULTURAL MARKETING AND PRICE ANALYSIS: THE CASE OF DOMESTIC MARKET PRICE VOLATILITY OF RICE IN INDIA WITH SPECIAL REFERENCE TO THE STATE OF KERALA

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**Abstract** The volatility of commodity price in the domestic and international markets has numerous policy implications. Policy makers, farmers, entrepreneurs and every player along in each level of market supply channels are very cautious and curious to know how price is behaving in the market to take firm decision. Examining price volatility is one of the key areas which needs considerable attention of researchers and policy makers in order to enable farmers, consumes, traders, policy makers and all stakeholders in the entire supply to right marketing decision in the market supply chain especially agricultural products concerned.

The objective of the present study was to examine the price volatility of selected rice variety in the in Kerala State. Accordingly, ARCH & GARCH model were employed to examine the volatility of price of rice in the Kerala state. Three types of rice variety viz., IR-8 rice variety, Jaya rice variety and Ponni rice variety were taken in to consideration based on the data availability for a period of ten years (2003-2013). State level secondary data, the monthly price of rice have been collected from Agricultural Marketing Information Network (Statistical and Analytical Reports) for the present study. The data have been analysed using Economic views (Eviews) statistical computer package.

The present study found that the price of Jaya rice variety in Kerala state signaled extreme price volatility compared with that of the price of IR-8 Rice variety and Ponni Rice variety in the Kerala state based on the result detected by the model. Accordingly, recommendations and policy implications have been drown based on the findings of the present study.

**Keywords:** Kerala, Market, Price volatility, Rice, Rice price.

**Introduction:** Rice is the most important and extensively grown food crop in the World. It is the staple food of more than 60 percent of the world population. Rice is mainly produced and consumed in the Asian region. India has the largest area under rice in the world and ranks second in the production after China. India has also emerged as a major rice consumer. In the states like Andhra Pradesh, Assam, Kerala, Orissa, Tamil Nadu and West Bengal, rice consumption accounted for more than 80 percent share in total cereal intake.

Kerala has experienced a drastic decline in the area under rice and size of rice production for the past one decade. The state registered a decline of area under rice and size of rice production from 703.4 thousand tone with area of 322 thousand hectares during the year 2001-02 to 614.3 thousand tone with area of 234 thousand hectares during the year 2009-10.

The contribution of Agriculture to the GDP of in Indian economy experienced a decline trend from 31% in 1990 to 24% in 2000/01 and 13.7% in 212/13 respectively. Similarly, agriculture in Kerala has undergone significant structural changes in the form of decline in share of GSDP from 26.9 Percent in 1990-91 to 9.1 percent in 2011-12, indicating a shift from the agrarian economy towards a service sector dominated economy. Although the share of agricultural GDP (agriculture and Animal Husbandry alone) has declined in almost all states, agriculture is an important contributor to GSDP in some States in 2011-12 like Punjab (21.5%), Assam (18.1%), Bihar (15.9%), Uttar Pradesh (20.3%). On the other hand the States like Tamilnadu (6.6%) and Kerala (7.7%) the share of agriculture is relatively low.

For the past ten years from the total food grain production in the Kerala state rice production covered 98-99 percent whereas, the share of rice production covers 39-44 percent of the total food grain production in India. This indicates rice is the most stable agricultural food grain and commodity to Kerala state which needs the attention of researcher and stakeholders since it can affect majority of the population.

The Kerala's agriculture, predominantly commodity trade dependent economy has been characterized by a high degree of price volatility.

Price Volatility is a measure of fluctuations or deviations in the commodity prices, it is the measure of the uncertainty of the returns realized on an asset, investment or on an exposure(Financial Technologies, 2014).

Extreme price volatility comes at a cost, since market actors will have difficulty planning ahead and adjusting to the fluctuating market signals. As unpredictable changes, or "shocks", surpass a certain critical size and persist at those levels, traditional policy prescriptions and coping mechanisms are likely to fail (FAO, 2010).

The effect of commodity price volatility extends to many activities beyond the sectors of production, with broader impacts on the overall economy affecting foreign-exchange earnings, government revenues, productive investment and, hence, growth (Sinott et al, 2010).

When considering changes in the price of agricultural commodities, one must distinguish between changes in trend and mere fluctuations (volatility). Changes in trend occur over medium- or long-term periods and are due to structural alterations in the factors affecting supply and demand of in this case food. Volatility refers to changes in rates of price variation over successive periods of time. There is a great deal of volatility when prices are rising and falling frequently. Addressing the issue of volatility on agricultural incomes has an impact on farmers' decisions on agricultural marketing decision. Though, rice cultivators expect the state government's intervention to provide substantial price support, examining the price volatility of rice in Kerala state can be an important input for policy makers and also farmers in particular to take immediate firm market decision that would enable them to realize better income.

**Statement of the problem:** Policy makers, farmers, entrepreneurs and every player along in each level of supply channels of the market are very cautious to know how price is experiencing in the market to take firm decision. Therefore, examining the volatility of the price of rice in the domestic market will help to understand the existing marketing situation and to take appropriate marketing decision to best benefit the market players out of it. Volatility of price of rice indicates how much and how quickly the price of rice changes over time. Price fluctuations are a common feature of well-functioning agricultural product markets. But when these become large and unexpected volatile they can have a negative impact on the food security of consumers, farmers and entire countries.

**Objective:** The objective of the study was to examine the price volatility of selected rice variety in Kerala state for the past ten years (2003-2013).

**Materials and Methods:** Auto Regressive Conditional Heteroskedasticity (ARCH) and Generalised Auto Regressive Conditional Heteroskedasticity (GARCH) model were employed to analyze the volatility of price of rice in the domestic market particularly in Kerala state. In order to measure price volatility in the Kerala state three types of rice variety were taken in to consideration based on the data availability for a period of ten years (2003-2013). State level secondary data, the monthly price of rice has been collected from Agricultural Marketing Information Network (Statistical and Analytical Reports) for the study. Among the available types of rice varieties in the Kerala state; in order to examine price volatility rice the state the present study considered only IR-8 rice variety, Jaya rice variety and Ponni rice variety based on the monthly price data availability throughout the past one decade. The data have been analysed using Economic views (Eviews) statistical computer package.

| Table 1: Price volatility of IR-8 Rice Variety in Kerala State from 2003-2013 | | | | |
|---|---|---|---|---|
| Dependent Variable: Price of IR-8 Rice Variety | | | | |
| Method: ML - ARCH (Marquardt) - Normal distribution | | | | |
| Sample: 2003Month 02 2013Month 12 | | | | |
| Included observations: 131 | | | | |
| GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1) | | | | |
| | Coefficient | Std. Error | z-Statistic | Prob. |
| C | 16.07188 | 11.22068 | 1.432344 | 0.1520 |
| Variance Equation | | | | |
| C | 10270.71 | 1060.718 | 9.682793 | 0.0000 |
| RESID(-1)^2 | 0.463796 | 0.195805 | 2.368657 | 0.0179 |
| GARCH(-1) | -0.081265 | 0.046836 | -1.735089 | 0.0827 |
| | | | | |
| R-squared | -0.001691 | Mean dependent var | | 10.64794 |
| Adjusted R-squared | -0.025353 | S.D. dependent var | | 132.4014 |
| S.E. of regression | 134.0693 | Akaike info criterion | | 12.35272 |
| Sum squared resid | 2282770. | Schwarz criterion | | 12.44051 |
| Log likelihood | -805.1031 | Durbin-Watson stat | | 2.789891 |

**Result and Discussion: Price Volatility of Selected Rice Variety in Kerala State:** In order to measure the price volatility of rice in Kerala state for the past 132 months (ten years) the GARCH model was employed and before running the model the data has converted from non stationary in to stationary.

The Price volatility of IR-8 rice variety as indicated in table 1 shows that the sum of the ARCH and GARCH coefficients $(\alpha+\beta)$ is not close to one, which is $(0.463796 + -0.081265 = 0.382531)$ indicating that the volatility shocks existed in the price of IR-8 Rice for the past one decade is not persistent.

| Table 2: Price volatility of Jaya Rice Variety in Kerala State from 2003-2013 | | | | |
|---|---|---|---|---|
| Dependent Variable: Price of Jaya Rice Variety | | | | |
| Method: ML - ARCH (Marquardt) - Normal distribution | | | | |
| Sample: 2003Month 02- 2013Month 12 | | | | |
| Included observations: 131 | | | | |
| GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1) | | | | |
|  | Coefficient | Std. Error | z-Statistic | Prob. |
| C | 11.15325 | 6.918229 | 1.612155 | 0.1069 |
| Variance Equation | | | | |
| C | 344.7842 | 353.6406 | 0.974957 | 0.3296 |
| RESID(-1)^2 | 0.521418 | 0.130376 | 3.999353 | 0.0001 |
| GARCH(-1) | 0.625549 | 0.078789 | 7.939541 | 0.0000 |
| R-squared | -0.000895 | Mean dependent var | | 15.14954 |
| Adjusted R-squared | -0.024538 | S.D. dependent var | | 134.0754 |
| S.E. of regression | 135.7105 | Akaike info criterion | | 12.38002 |
| Sum squared resid | 2339001. | Schwarz criterion | | 12.46781 |
| Log likelihood | -806.8914 | Durbin-Watson stat | | 2.299117 |

The Price volatility of Jaya Rice Variety for the last ten years as indicated above table 2 shows that the sum of the ARCH and GARCH coefficients $(\alpha+\beta)$ is equal to one, which is 0.521418 + 0.625549 =1.146967 indicating that, volatility shocks existed in the price of Jaya rice for the past ten years in India particularly in the Kerala state is quite persistent.

| Table3: Price volatility of Ponni Rice Variety in the Kerala State from 2003-2013 | | | | |
|---|---|---|---|---|
| Dependent Variable: Price of Ponni Rice Variety | | | | |
| Method: ML - ARCH (Marquardt) - Normal distribution | | | | |
| Sample: 2003 Month 02-2013Month 12 | | | | |
| Included observations: 131 | | | | |
| GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1) | | | | |
|  | Coefficient | Std. Error | z-Statistic | Prob. |
| C | 5.774051 | 14.00169 | 0.412383 | 0.6801 |
| Variance Equation | | | | |
| C | 8933.468 | 2331.401 | 3.831802 | 0.0001 |
| RESID(-1)^2 | 0.668527 | 0.268672 | 2.488267 | 0.0128 |
| GARCH(-1) | 0.248318 | 0.175441 | 1.415391 | 0.1570 |
| R-squared | -0.000890 | Mean dependent var | | 12.51878 |
| Adjusted R-squared | -0.024533 | S.D. dependent var | | 226.9930 |
| S.E. of regression | 229.7605 | Akaike info criterion | | 13.13303 |
| Sum squared resid | 6704317. | Schwarz criterion | | 13.22082 |
| Log likelihood | -856.2136 | Durbin-Watson stat | | 2.918493 |

The existence of such extreme rice price volatility in the state indicates that the set of rates of changes of Jaya rice prices with the likelihood of realization equal to no more than some low level of chance. To consumers averse to price spikes, extreme price volatility refers to high order surges of periodic

prices. In the case of farmers, unexpected plunges of food prices may inflict financial losses, perhaps leading to business closures. Both consumers and producers find extreme swings of Jaya rice prices to be unwelcome, as these introduce uncertainty in spending and business. In both cases, the state governments and policy makers are concerned because of the adjustment costs that their constituencies have to bear.

The price volatility of Ponni Rice variety in the Kerala state for the last ten years as indicated table 3 shows that the sum of the ARCH and GARCH coefficients ($\alpha+\beta$) is less than one, which is 0.668527+0.248318=0.916845 indicating that volatility shocks existed in the price of Ponni rice variety in the Kerala state is not persistent.

The model detected that, the price of Jaya rice variety signals extreme price volatility compared with that of the price of IR-8 Rice variety and Ponni Rice variety in the Kerala State. Therefore, the price spike and swing exhibited in Jaya rice variety seeks considerable further attention of policy makers to make sure that farmers are not affected by the existed price behavior in the market.

**Recommendations & Policy Implications:** Monitoring food prices, both on cash and futures markets, is essential in a food market monitoring system. In a similar manner, assessing changes in factors of demand and supply and analysing their impact on food markets is important. Additionally supporting an improved post-production handling, processing and storage facilities and better

interaction among farmers, service providers, traders and agribusiness firms are a better opt to sustain market efficiency to benefit all participants from the market. Since the price of Jaya rice variety in Kerala state signaled extreme price volatility compared with that of the price of IR-8 Rice variety and Ponni Rice variety. Therefore, considerable attention of policy makers is required on the price of Jaya rice to make sure that farmers are not affected by the existed price behavior in the market. In order to strengthen the capacity of farmers to withstand risks related to supply or price shocks through more- resilient production practices, better linkages among value chain actors and improved rural market infrastructure is necessary.

**Conclusion:** To mitigate the extreme price volatility exhibited in the Kerala state rice market, examining price volatility of rice is not an end by itself. In the light of the present study an urge calling to the attentions of Farmers, policy makers, Researchers and Academicians in the area to respond accordingly in order to ensure every participant in each level of the market supply chains are benefited out of the market transaction. Price volatility of rice creates uncertainty and undermines investor confidence in the sector and farmers in particular. Therefore a coordinated public-private effort to address price volatility of agricultural commodities like rice is therefore essential, at the same time recognizing that a mix of policies will be necessary which can address the issues of farmer, low income agricultural laborers and consumers

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