Economic Affairs, Vol. **69**(01), pp. 427-435, March 2024
DOI: 10.46852/0424-2513.2.2024.4

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RESEARCH PAPER

An Assessment of Price Transmission in Major Pulses Markets in Karnataka

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Received: 29-11-2023 **Revised:** 08-02-2024 **Accepted:** 25-02-2024

ABSTRACT

The purpose of present study was to estimate the price transmission processes of pulses markets in Karnataka state. For that 30 years secondary data on the prices of pulses especially redgram and bengalgram were collected from 1989-90 to 2018-19 and analyzed by using techniques such as CAGR, Johansen Co-integration approach, VAR Model, Granger Causality test to fulfil the objectives. The study concluded that the results of both trace and maximum eigen-value tests indicated that the selected major pulses market such as Kalaburagi, Bidar, Bellary, Raichur and Koppal are cointegrated with each other in the long run and indicated that these markets are efficiently running and they are competitive in nature. The study showed that market pairs in redgram such as Bidar-Kalaburagi, and Raichur-Bidar are exhibiting bidirectional causality, whereas market pairs such as Kalaburagi-Raichur, Koppal-Kalaburagi, Bidar-Bellary, Koppal-Bidar and Koppal-Raichur are expressed unidirectional causality. In case of bengalgram, markets pairs such as Bidar-Kalaburagi, Kalaburagi-Raichur, Bellary-Bidar, Raichur-Bellary are expressed the bidirectional causality.

HIGHLIGHTS

- The study concluded that a change in the prices of bengalgram in Kalaburagi market causes the price development in Bidar and Raichur markets, similarly a price change in Bidar market is basis for the price development in Kalaburagi and Bellary markets.
- The study showed that selected pulses markets in the Karnataka are strongly associated with each other in the long run and illustrated a unidirectional as well bidirectional price transmission effect in both redgram and bengalgram markets.

Keywords: Price transmission, Market Integration, Pulses, JCA, VAR Model

Pulses are an important commodity group of the agriculture sector that provides high quality protein to the Indian population. India is the largest producer and consumer of pulses in the world (Smita and Satyasai, 2015). Among the states, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and Karnataka are the top five in pulses production in India. In Karnataka, pulses production increased from 1737 to 2170 thousand tonnes during 2016-17 to 2020-21 respectively (GOI, 2021). The pulses are majorly grown in Kalyan-Karnataka region viz., Bidar, Bellari, Kalburagi, Yadgir, Koppal and Raichur in the Karnataka state. Among the districts, Kalaburagi district is considered a pulses bowl of Karnataka and district market is one of the major markets for pulses in the state. It has a significance influence on market price of the pulses in surrounding pulses markets such as Bidar, Bellari, Raichur and Koppal. As Kalaburagi market is the regional market for the pulses in the

How to cite this article: Jainuddin S.M., Joshi, A.T., Manojkumar, G. and Raj, S. (2024). An Assessment of Price Transmission in Major Pulses Markets in Karnataka. *Econ. Aff.*, **69**(01): 427-435.

Source of Support: None; **Conflict of Interest:** None

state, the change/fluctuation in the prices of redgram and chickpea in Kalburagi market might have a positive or negative impact on the prices of these pulses in the other markets of the region. So the estimation of this price transmission process among the pulses market is very much needed.

Price transmission provides insights into vertical and horizontal integration of agricultural markets, and producer and consumer welfare (Seema Bathla and R. Srinivasulu, 2011). The accuracy and speed at which price change in one market gets transmitted to other markets is taken as an indicator of integration among the markets (Seema Bathla and R. Srinivasulu, 2011). The extent of integration gives signals for efficient resource allocation, which is considered essential for ensuring greater market efficiency, price stability and food security (Seema Bathla and R. Srinivasulu, 2011). Test of integration also plays a key role in food and price stability (Jha *et al.* 2005; Acharya, 2001).

Hence, based on the above background, the present study was undertaken in Kalyana-Karnataka region with the overall objective of assessing the price transmission processes of major pulses markets in the state. The results of this study may help in suggesting suitable policies and also help for local-level planning to increase pulse production and productivity and bridge the demand-supply gap in the state as well as in the country. The main objectives of the study are as follows;

- To analyze the growth and nature of instability in price, area, production and yield of pulses in Kalyana-Karnataka region.
- To analyze the price transmission processes of major pulses in Kalyana-Karnataka region.

MATERIALS AND METHODS

The major pulse markets in the Karnataka such as Kalaburagi, Bidar, Bellary, Raichur and Koppal markets were selected for the study. Among pulses crops, the redgram and chickpea were selected for the study due to the highest area under crops in the Kalyan-Karnataka region.

Nature and sources of data

To fulfill the objectives of the study, 30 years of secondary data relating to area, production, prices and yield of redgram and chickpea at the district levels was used and obtained from various secondary sources like the Directorate of Economics and Statistics, Bangalore, Department of Agriculture and Co-operation, Indiastat.com, etc.

The annual wholesale price data were used to analyze the price transmission process in major redgram and chickpea markets in Kalyan-Karnataka region. The study considers price data from 1989-90 to 2018-19. The wholesale price data was collected from District Statistical Office of the respective districts.

Analytical Tools and Techniques

The data collected from primary and secondary sources would be subjected to appropriate analytical techniques in order to arrive at meaningful conclusions and policy options.

Augmented Dicky-Fuller (ADF) Test

The econometric test such as Dicky-Fuller (DF) test, Augmented Dicky-Fuller (ADF) test (Dicky & Fuller, 1979, 1982) and the Philips- Perron (PP) test were commonly used for testing the stationary of the time series data. In this study, the ADF test was used to determine the data properties due to its common application in the time series literature. The ADF test as mentioned considers the null hypothesis that a given series is non-stationary. The test is applied by running a regression of the following form:

$$\Delta Y_t = \beta_1 + \gamma Y_{t-1} + \alpha_t \sum \Delta Y_{t-1} + \varepsilon_t$$

If the coefficient "Y" is not statistically different from zero, then the series has a unit root and therefore is non-stationary. The price series will be tested for stationarity as in the equation above where Y_i denote price series of the selected markets and i = 1, 2 ..., 5 (selected markets).

Johansen's Multiple Co-integration

To check the cointegration between two pulses markets, we used Johansen's multiple co-integration approaches. It helps to check the number of co-integration equations present in the model and that indicates long-run association between selected markets in the region. The presence of number of co-integration equations was decided based upon either maximum Eigen value or Trace statistics.

The Johansen procedure was carried out through three steps; firstly, selections of appropriate lag length based on Akaike Information Criterion (AIC). Secondly, the order of integration was confirmed by using ADF test. In the third step, trace and max Eigen statistics value are estimated by using Johansen's cointegration approach based on the vector autoregressive (VAR) model. According to Johansen and Juselius (1990), any p-dimensional vector autoregression can be written in the following "error correction" representation.

$$\Delta X_t = \sum_{i=1}^{k} \Delta X_{t-1} + \prod X_{t-k} + \mu + \varepsilon$$

Where;

X_t = p-dimensional vector of I(1) processes, μ = A constant

ε_t = A p-dimensional vector with zero mean (Δ is the variance– covariance matrix)

The Π matrix has a rank that is limited in the interval (0,r) and can be decomposed into components as follows;

$$\Pi = \alpha\beta$$

where; α, $\beta_{p\times r}$ matrices, r: Distinct cointegrating vectors

Granger causality test

Granger causality test were commonly used If the two variables are integrated of order one, i.e., I(1). This study also performed Granger Causality test which explained that the wholesale price in market A causes the price in market B if and only if the past values of market A provide additional information for the forecast of market B. The Granger Causality test were performed after confirming the existence of co-integration between two pulses markets in the Kalyan-Karnataka region. Johansen and Juselius (1990) maximum likelihood approach was used to realize the cointegration between the pulses markets. The Johansen cointegration test explained that if the cointegration exists among the variables, then Granger causality must also exist either unidirectional or bidirectional (Mumtaz Ahmed and Naresh Singla, 2017). After confirming the integration of prices series in the selected markets, granger causality test was performed to know causal relation between markets of redgram and bengalgram in the region. In Granger causality test, tests the null hypothesis of no causality between the selected pairs of markets.

RESULTS AND DISCUSSION

Market Price trends in Redgram and Bengalgram

The farm harvest prices of redgram markets trends were presented in Fig. 1. The results indicated that the symmetric movement of redgram prices was noticed in all markets except Koppal markets. The redgram prices gradually increasing over the period with sharp increase during 2015. The maximum farm harvest price was noticed in Kalaburagi (₹ 6380/qtl) markets and minimum was noticed in Raichur (Rs 615/qtl) markets.

The bengal gram price trend were presented in Fig. 2. The similar trend was noticed in bengal gram price as like redgram prices in all markets except Kalaburagi and Koppal markets. The farm harvest price showed a increasing trend in Bidar, Bellary and Raichur markets with irregular fluctuation over the period and price of the commodity increased sharp during 2015.

Descriptive analysis of market prices

The descriptive (Table 1) analysis of market prices showed that the farm harvest prices of both bengalgram and redgram crops remained highly volatile in Raichur (62.54 % and 66.54 % respectively) followed by in Kalaburagi (55.39 % and 59.33% respectively). The lowest average prices were noticed in Koppal market for both the crops. The price of both crops in Raichur market is remained highly volatile than compared to other markets in Kalyana Karnataka region.

The results showed that the symmetric price movement was noticed in both redgram bengalgram in all selected markets such as Kalaburagi, Bidar, Raichur, Bellary and Koppal markets. The similar price trend was noticed in both (Fig. 1 and Fig. 2) such as price of both crops gradually increasing over the period of time with sharp increase during 2015 it might be due to shortage of supply of commodity in the markets because of uncertainty in the weather conditions. The farm harvest prices of both bengalgram and redgram crops (Table

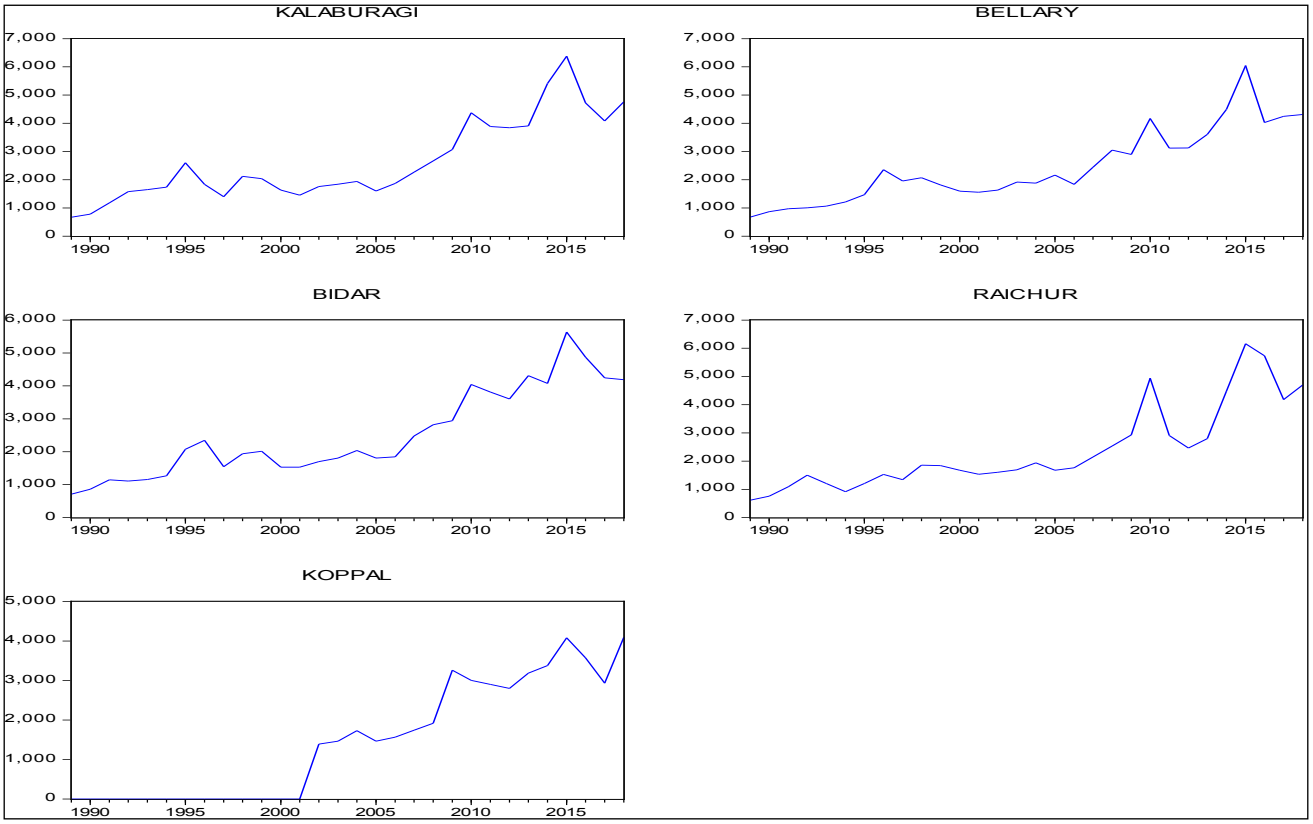

Fig 1: Price behaviour of Redgram (₹/Quintal) in selected markets

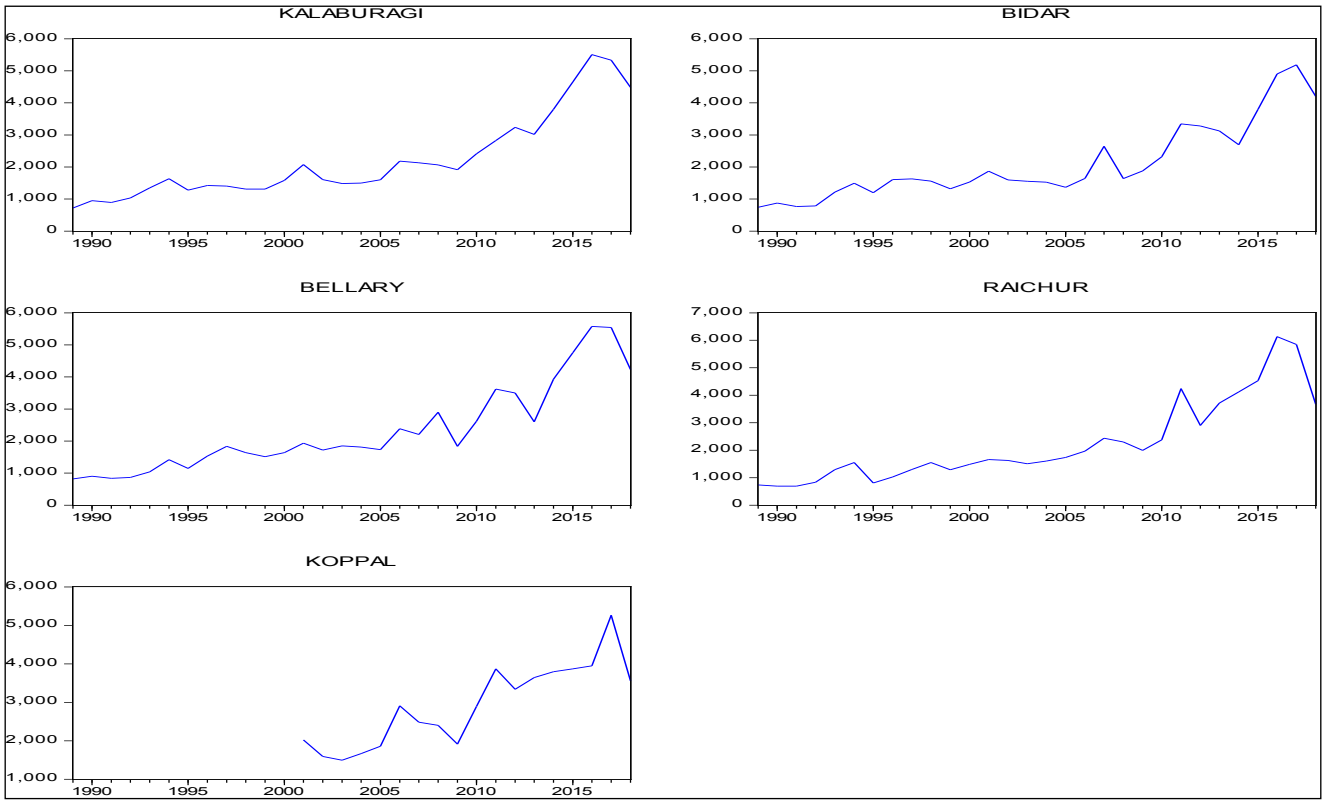

Fig. 2: Price behaviour of Bengal gram (₹/Quintal) in selected markets

1) showed highly volatality in Raichur followed by in Kalaburagi as indicated by higher value in coefficient of variation.

Unit Root Test of Redgram and Bengalgram Markets

The results of the ADF test for redgram markets at the level and at first difference were presented in the Table 2. The price series of all the five markets such as Kalaburagi, Bidar, Bellary, Raichur and Koppal were accepted the null hypothesizes of having unit root at their levels at 5% significance level. The test statistics of ADF test is also smaller in all markets than compared with critical values which signify that the redgram price series are non stationary in nature at first level. The redgram price series in all the secreted markets were rejected the null hypothesizes at first difference I (1) which signifies that the underlying time series are stationary. The test statistics value is greater in all five markets than the critical values at 5% level of significance which signifies that the redgram price series are stationary in nature.

The ADF test results for bengalgram markets at the level and at second difference were presented in Table 3. The market price series in all selected markets were accepted the null hypothesizes at 5%

Table 1: Summary Statistics of the farm harvest Prices for Pigeon pea and Bengalgram crops in selected markets (1989-90 to 2018-19)

Statistics	Kalaburagi	Bidar	Bellary	Raichur	Koppal
	Descriptive Statistics of Pigeon pea				
Mean	2634.83	2514.83	2452.00	2390.53	1481.76
Median	1987.50	2024.50	2012.50	1801.50	1461.50
Maximum	6380.00	5636.00	6048.00	6163.00	4093.00
Minimum	671.00	710.00	677.00	615.00	1388.00
Std. Dev.	1459.33	1332.61	1319.45	1495.05	1492.72
CV (%)	55.39	52.99	53.81	62.54	36.09
	Descriptive Statistics of Bengalgram				
Mean	2878.72	2698.11	3040.77	3021.16	2917.55
Median	2296.50	2483.00	2607.50	2406.00	2900.00
Maximum	5507.00	5187.00	5577.00	6135.00	5264.00
Minimum	1485.00	1365.00	1717.00	1507.00	1496.00
Std. Dev.	1334.29	1209.77	1305.53	1471.21	1056.87
CV (%)	59.33	56.93	58.11	66.17	36.23

Table 2: Augmented Dickey-Fuller test results for unit root in Redgram price series

Variables	ADF results at level				
	t-Statistic	**CV (5%)**	**Prob.***	**Decision**	**Remarks**
Kalaburagi	-0.412937	-2.976263	0.8934	Accept	Non Stationery
Bidar	-1.104660	-2.967767	0.7002	Accept	Non Stationery
Bellary	1.069405	-2.986225	0.9960	Accept	Non Stationery
Raichur	-1.104660	2.271941	0.9999	Accept	Non Stationery
Koppal	-0.190870	-2.967767	0.9291	Accept	Non Stationery
	ADF results after Differencing				
	t-Statistic	**CV (5%)**	**Prob.***	**Decision**	**Remarks**
Δ(Kalaburagi)	-6.014718	-2.976263	0.0000	Reject	Stationery
Δ(Bidar)	-6.507516	-2.971853	0.0000	Reject	Stationery
Δ(Bellary)	-8.135576	-2.991878	0.0000	Reject	Stationery
Δ(Raichur)	-6.507516	-2.971853	0.0010	Reject	Stationery
Δ(Koppal)	-5.683990	-2.971853	0.0001	Reject	Stationery

Table 3: Augmented Dickey-Fuller test results for unit root in Bengalgram price series

Variables	ADF results at level				
	t-Statistic	**CV (5%)**	**Prob.***	**Decision**	**Remarks**
KALABURAGI	1.444560	-2.981038	0.9986	Accept	Non Stationery
BIDAR	1.170565	-2.998064	0.9968	Accept	Non Stationery
BELLARY	1.500579	-2.998064	0.9987	Accept	Non Stationery
RAICHUR	2.164280	-3.004861	0.9998	Accept	Non Stationery
KOPPAL	-1.481745	-3.052169	0.5182	Accept	Non Stationery
	ADF results after II Differencing				
	t-Statistic	**CV (5%)**	**Prob.***	**Decision**	**Remarks**
Δ(KALABURAGI, 2)	-4.477473	-2.991878	0.0018	Reject	Stationery
Δ(BIDAR, 2)	-7.483818	-2.998064	0.0000	Reject	Stationery
Δ(BELLARY, 2)	-6.355080	-2.998064	0.0000	Reject	Stationery
Δ(RAICHUR, 2)	-7.745414	-2.998064	0.0000	Reject	Stationery
Δ(KOPPAL, 2)	-3.304401	-3.119910	0.0366	Reject	Stationery

significance level which signifies that the price series are non stationary in nature. The null hypothesis is rejected at second difference I (2) which signifies that the underlying price series are stationary.

The study concluded that the prices of redgram markets are to be integrated of order 1 i.e., I(1), whereas the prices of bengalgram are to be integrated of order 2 i.e., I(2) in all the five markets. This indicated that all the five market price of both redgram and bengalgram are stationary in nature. The appropriate number of lag length of the model was selected based on Akaike Information Criterion (AIC).

Johansen's Co-integration approach

Johansen's cointegration tests results for redgram markets were presented in Table 4. The results showed that, both maximum eigen-value test and trace value rejected the null hypothesis of no cointegration and accepted the alternative hypothesis having the presence of one cointegration equation among the redgram markets. The rejection or acceptance of the null hypothesis was decided based on trace value and max- eigen test statistics values against their critical value and corresponding probability value. The null hypothesis from r=0 and r≥1, as the trace statistics (73.93204) and max eigen value (35.67524) are greater than compared to critical values at 0.05% level of significance. The result showed that there is presence of one cointegration equation in each pair of the redgram markets in the region.

Based on the values of both maximum eigen-value test and trace value accepted the alternative hypothesis having one cointegration equation among selected redgram (Table 4) markets. This clearly indicated that the selected markets such as Kalaburagi, Bidar, Bellary, Raichur and Koppal are cointegrated with each other in the long run. This also indicated that the prices of redgram in the selected markets are integrated with each other in the long run and these markets working efficiently. The results of the study are in line with most of the regional research work Reddy *et al.* 2012; Sendhil *et al.* 2014; Rajendran, 2015; Ahmed and Singh, 2017.

Johansen's cointegration tests for bengalgram markets were presented in Table 5. The results showed that the maximum eigen-value and trace test rejected the null hypothesis of having no cointegration and accepted the alternative hypothesis of having cointegration equation among bengalgram markets. The null hypothesis from $r = 4$ and $r \geq 5$, as the trace statistics and max eigen values (5.172332) are greater than compared to critical values (3.841466) at 0.05% level of significance. This showed that there is presence of five cointegration equation in the selected bengalgram markets. This indicated that the bengalgram markets in Kalyana Karnataka region are cointegrated with each other in the long run.

Based on the test values of eigen-value and trace test, the study accepted the alternative hypothesis of having five cointegrated equation among selected bengalgram (Table 5) markets. This indicated that the selected bengalgram markets such as

Table 4: Johansen Co-integration test results for Redgram prices in study area

H_0	H_1	Trace Statistics results			Max-Eigen Statistics results		
		Trace Statistic	Critical Value (0.05)	Prob.*	Max-Eigen Statistic	Critical Value (0.05)	Prob.*
r=0*	r≥1	73.93204	69.81889	0.0226	35.67524	33.87687	0.0302
r≤1	r≥2	38.25680	47.85613	0.2909	19.48360	27.58434	0.3780
r≤2	r≥3	18.77320	29.79707	0.5093	10.61573	21.13162	0.6855
r≤3	r≥4	8.157473	15.49471	0.4487	8.121300	14.26460	0.3665
r≤4	r≥5	0.036173	3.841466	0.8491	0.036173	3.841466	0.8491

*Trace test indicates 1 cointegrating eqn(s) at the 0.05 level; Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level.*

Table 5: Johansen Co-integration test results for bengalgram prices in study area

H_0	H_1	Trace Statistics results			Max-Eigen Statistics results		
		Trace Statistic	Critical Value (0.05)	Prob.*	Max-Eigen Statistic	Critical Value (0.05)	Prob.*
r=0*	r≥1	214.0950	69.81889	0.0000	129.1306	33.87687	0.0000
r=1*	r≥2	84.96441	47.85613	0.0000	43.85238	27.58434	0.0002
r=2*	r≥3	41.11203	29.79707	0.0017	20.53360	21.13162	0.0604
r=3*	r≥4	20.57843	15.49471	0.0078	15.40610	14.26460	0.0329
r=4*	r≥5	5.172332	3.841466	0.0229	5.172332	3.841466	0.0229

Note: *Trace test indicates 5 cointegrating eqn(s) at the 0.05 level; Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level.*

Kalaburagi, Bidar, Bellary, Raichur and Koppal are cointegrated with each other in the long run and showed that they working effectively and efficiently in the long run. This also indicated that the prices of the bengalgram in selected markets are competitive enough because the movements of the prices are closely associated in the long run. The results of the study in line with Reddy *et al.* 2012; Sendhil *et al.* 2014; Rajendran, 2015; Ahmed and Singh, 2017.

Granger Causality test results

The pair-wise granger causality tests was carried out for redgram markets and presented in the Table 6. The results showed that the market pairs such as Kalaburagi-Bidar, Bidar-Kalaburagi, Raichur-Bidar and Bidar-Raichur have bidirectional causality. This indicated that bidirectional changes in the prices of redrggram in these markets. In case of Kalaburagi-Bidar bi-directional causality showed that a price change in the Kalaburagi market cause the price formation in the Bidar market, whereas the price change in the Bidar market is having influence on Kalaburagi market. Similar results were noticed in other market pairs. The market pairs such as Kalaburagi-Raichur, Koppal-Kalaburagi, Bidar-Bellary, Koppal-Bidar, Bellary-Raichur, Koppal-Bellary and Bellary-Koppal showed a unidirectional causality in the region. This indicated that in case of Kalaburagi-Raichur market pair, a price change in the Kalaburagi market cause the price development in the Raichur market, whereas the price change in the Raichur market is not have any impact on the price of redgram in Kalaburagi market. The results are in line with Ahmed and Singh, 2017. The rest of the pairs showed no causality between the markets in the redgram.

The pair-wise granger causality tests results for bengalgram markets were presented in Table 7. The study showed that market pairs such as Kalaburagi-Bidar, Bidar-Kalaburagi, Raichur-Kalaburagi, Kalaburagi-Raichur, Bellary-Bidar, Bidar-Bellary, Raichur-Bellary and Bellary-Raichur have bidirectional causality. The rest of the market pairs have showed no causality between the markets.

The study concluded that after the confirmation about long-run co-integration of price series in the selected markets, the pair-wise granger causality

Table 6: Pairwise Granger Causality Tests results of selected Redgram markets

Market Pairs	No. of Obs	F-Statistics	P-Value	Decision of Null Hypothesis	Remarks
Bidar-Kalaburagi	30	7.93451*	0.0024	Do Not Reject	Bi-directional
Kalaburagi-Bidar	30	16.8946*	0.00003	Do Not Reject	Bi-directional
Bellary-Kalaburagi	30	0.51504	0.6042	Reject	No Causality
Kalaburagi-Bellary	30	1.80718	0.1867	Reject	No Causality
Raichur-Kalaburagi	30	0.98299	0.3894	Reject	No Causality
Kalaburagi-Raichur	30	3.49254**	0.0474	Do Not Reject	Unidirectional
Koppal-Kalaburagi	30	2.77140***	0.0835	Do Not Reject	Unidirectional
Kalaburagi-Koppal	30	0.71784	0.4984	Reject	No Causality
Bellary-Bidar	30	1.13647	0.3383	Reject	No Causality
Bidar-Bellary	30	3.19167***	0.0598	Do Not Reject	Unidirectional
Raichur-Bidar	30	2.96752***	0.0714	Do Not Reject	Bi-directional
Bidar-Raichur	30	6.14337*	0.0073	Do Not Reject	Bi-directional
Koppal-Bidar	30	3.89245*	0.0350	Do Not Reject	Unidirectional
Bidar-Koppal	30	0.23956	0.7889	Reject	No Causality
Raichur-Bellary	30	2.16377	0.1377	Reject	No Causality
Bellary-Raichur	30	6.53587*	0.0057	Do Not Reject	Unidirectional
Koppal-Bellary	30	3.06887***	0.0659	Do Not Reject	Unidirectional
Bellary-Koppal	30	1.05688	0.3638	Reject	No Causality
Koppal-Raichur	30	6.27730*	0.0067	Do Not Reject	Unidirectional
Raichur-Koppal	30	0.60415	0.5550	Reject	No Causality

Note: **, ** and *** represents the level of significance at 1%, 5% and 10% respectively.*

Table 7: Pairwise Granger Causality Tests results of selected Bengalgram markets

Market Pairs	No. of Obs	F-Statistics	P-Value	Decision of Null Hypothesis	Remarks
Bidar-Kalaburagi	30	6.62827*	0.0059	Do Not Reject	Bi-directional
Kalaburagi-Bidar	30	12.1211*	0.0003	Do Not Reject	Bi-directional
Bellary-Kalaburagi	30	0.22079	0.8037	Reject	No Causality
Kalaburagi-Bellary	30	1.54636	0.2363	Reject	No Causality
Raichur-Kalaburagi	30	3.38108***	0.0533	Do Not Reject	Bi-directional
Kalaburagi-Raichur	30	12.0501*	0.0003	Do Not Reject	Bi-directional
Koppal-Kalaburagi	30	0.12422	0.8847	Reject	No Causality
Kalaburagi-Koppal	30	1.65817	0.2437	Reject	No Causality
Bellary-Bidar	30	7.85810*	0.0028	Do Not Reject	Bi-directional
Bidar-Bellary	30	12.1921*	0.0003	Do Not Reject	Bi-directional
Raichur-Bidar	30	0.23286	0.7943	Reject	No Causality
Bidar-Raichur	30	1.25872	0.3046	Reject	No Causality
Koppal-Bidar	30	0.35943	0.7077	Reject	No Causality
Bidar-Koppal	30	1.04715	0.3901	Reject	No Causality
Raichur-Bellary	30	5.92764*	0.0091	Do Not Reject	Bi-directional
Bellary-Raichur	30	3.81549**	0.0386	Do Not Reject	Bi-directional
Koppal-Bellary	30	0.05379	0.9479	Reject	No Causality
Bellary-Koppal	30	0.49561	0.6249	Reject	No Causality
Koppal-Raichur	30	0.12674	0.8825	Reject	No Causality
Raichur-Koppal	30	0.92802	0.4301	Reject	No Causality

Note: **, ** and *** represents the level of significance at 1%, 5% and 10% respectively.*

tests were carried out for redgram and bengalgram markets. The study showed that in redgram (Table 6) markets, a change in the prices of redgram in the Kalaburagi markets causes price development in Bidar, Raichur and Koppal markets, whereas a change in the prices of redgram in Bidar market cause the price formation in Kalaburagi, Bellary, Raichur and Koppal markets. The changes in the price of redgram in Koppal market are the basis for the price formations in Raichur, Bellary, Bidar and Kalaburagi markets. The results are in line with Ahmed and Singh, 2017. The study concluded that a change in the prices of bengalgram (Table 7) markets in Kalaburagi market causes the price development in Bidar and Raichur markets, similarly a price change in Bidar market is basis the price development in Kalaburagi and Bellary markets in the region.

CONCLUSION

The study concluded that major redgram and bengalgram markets of region such as Kalaburagi, Bidar, Bellary, Raichur and Koppal are cointegrated with each other in the long run and these markets are working efficiently in the region. The study indicated that a change in the prices of redgram in the Kalaburagi market causes price development in Bidar, Raichur and Koppal markets, where as a change in the prices of redgram in Bidar market cause the price formation in Kalaburagi, Bellary, Raichur and Koppal markets. The study concluded that a change in the prices of bengalgram in Kalaburagi market causes the price development in Bidar and Raichur markets, similarly a price change in Bidar market is basis the price development in Kalaburagi and Bellary markets in the region. The study concluded that all the selected markets of redgram and bengalgram showed a strongly co-integrated with each other in the long run and are exhibits unidirectional as well bidirectional price transmission effect in the markets.

ACKNOWLEDGEMENTS

This paper is extracted from the Demand Driven Staff Research Project report entitled Price Transmission in Major Pulses Markets of Kalyana-Karnataka Region: An Econometric Analysis submitted to the DOR, UAS Raichur. I express my special thanks to Directorate of Research UAS, Raichur for their financial support through Staff research project.

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