International Journal of Agriculture Sciences
ISSN: 0975-3710&E-ISSN: 0975-9107, Volume 9, Issue 40, 2017, pp.-4621-4625.
Available online at http://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

A STUDY ON THE VARIABILITY IN MARKET ARRIVALS AND PRICES OF POTATO IN SOME SELECTED MARKETS OF WEST BENGAL

BERA B.[1], DUTTA JAYANTA[2*] AND NANDI A.[1]

[1]Department of Agricultural Economics, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, 741252, India
[2]Agricultural Economics, RRS (OAZ), Uttar Banga Krishi Viswavidyalaya, Majhian, Patiram, D. Dinajpur, India
*Corresponding Author: Email-jdeco@rediffmail.com

Received: August 01, 2017; Revised: August 22, 2017; Accepted: August 23, 2017; Published: August 30, 2017

Abstract- Extreme volatility in prices of potato is haunting the producers and consumers of the state for the last few years. The instability is greater in market arrival compared to prices across the markets and months within the same markets. In general, peak/ just after harvesting periods have experienced the higher level of fluctuations than lean periods in both cases. Trend in market arrivals is negative in all the markets except Champadanga whereas price trend is positive in all markets with difference in magnitudes. Seasonal indices of markets arrivals reflect an upward movement starting from harvesting season to lean season in Champadanga, whereas a continuous deceleration is recorded in Dhupguri and Memari. Irregular movement is observed in Bishnupur and Jhargram markets may be due to differences in availability of marketing facilities particularly storage, transport, nearby large terminal markets. Excepting Champadanga market, current price is negatively related with market arrivals and positive with lagged prices which are very common in highly perishable vegetable crops like potato.

Keywords- Market Arrival, Potato, Price Fluctuation, Variability, West Bengal

Citation: Bera B., et al., (2017) A Study on the Variability in Market Arrivals and Prices of Potato in Some Selected Markets of West Bengal. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 9, Issue 40, pp.-4621-4625.

Academic Editor / Reviewer: Dr Pradeep Mishra, R. R. Christian

Introduction

Fluctuation in prices of agricultural commodities is a common phenomenon due to seasonality and biological nature of the crops and heavy dependence on climatic conditions resulting large variation in output. Wide variation in the production of the crops subsequently leads to larger variation in the market arrivals. It is argued that fluctuations in market arrivals are also responsible for short term price fluctuation arising out of imbalances in demand for and supply of agricultural commodities. Market arrivals and market prices are subjected to wide fluctuation [1]. This variation in prices of farm products adversely affects the income of the farmers leading to instability in farm investments and subsequently affects the productivity of the crops. Again this uncertain movement of prices of farm commodities affects the millions of non-farming population of the country, particularly engaged in unorganized sectors whose wages are not index–linked. So the both the producers, specially the small and marginal farmers of developing countries, like India with low propensity to save and lacking access to efficient saving instruments and consumers find it difficult to cope with high fluctuation in commodity prices. So, there is a need to have a proper understanding of the inter-relationship between market arrivals and prices of farm products for formulating a sound agricultural price policy for price stabilization. The large variation in price is important to understand because it implies not only that consumers pay different prices in different locations for same products (unless subsidized by schemes such as PDS) but producers also get different prices depending on where they are physically situated [2]. Such analysis will be of immensely helpful to the farmers in order to decide the optimum time for disposing off their produce to get a better price.

Under this pretext, the present study has been designed to examine the seasonal price movement in relation to market arrivals of potato in some selected markets of the state of West Bengal keeping in view the extreme volatility of prices of potato during the last few years which is haunting both the producers and consumers and forced the state government to regulate the prices sometimes to protect the consumers and to provide remunerative prices to the farmers in some cases considering the importance of the crop in the rural economy of the state. The area under potato cultivation in the state is 4.122 lakh ha. (19.85% of total area under the crop in India) with 120.27 lakh tones of production (25.05% of all India production) in 2014-15. Although price fluctuation is common phenomenon in case of seasonal and perishable commodities like potato [3, 4] but the extreme volatility in prices affects the producers heavily due to increasing cost of production in recent times arising out of galloping rise in prices of chemical fertilizers, pesticides and seeds mostly brought from Punjab. Prices tend to be lower just after harvesting and show upward trend in the subsequent months towards lean season. The increase in off-season price compared to immediate post harvest price potato markets of Maharastra were 30% [5]. Relatively inelastic demand for potato [6] and higher price fluctuations in retail level lower the consumer welfare [7]. Under this back ground the present study is an attempt to deal with the issues of variability in market arrivals and price along with the extent of intra-year price instability in some selected markets of West Bengal. The specific objectives the study can be delineated as follows:

a) To study the trends in market arrivals and prices of potato in some selected markets of West Bengal;
b) To analyse the seasonal behavior of market arrivals and prices; and
c) To examine the relationship of current wholesale prices with market arrivals as well as one lagged wholesale prices of potato.

Materials and methods

Monthly time-series data on market arrivals and prices of potato covering period 2011-16 owing to purposively selected five markets, namely, Champadanga, Dhupguri, Bishnupur, Memari and Jhargram markets belonging to five potato growing districts, *viz*, Hooghly, Jalpaiguri, Bankura, Bardhaman and Purba Medinipur districts of West Bengal, respectively, have been collected from the secondary sources 'agmarknet' form the basis of the study. To analyse the trends in market arrivals and prices for each five markets separately, ordinary least square technique of the following form has been employed.

$Y_t = a + bt + U_t$

Y_t= Monthly time series data on market arrivals/prices, a= intercept, b= coefficient and t= time period in month and U_t= disturbance terms.

To analyse the seasonal factors, the most widely used ratio to moving average method has been applied. As the 12-months centered moving average represents the influence of trend and cyclical component, the ratio of actual value (market arrivals or price) to corresponding 12-month moving average is presumed to remove the impact of trend and cyclical component. Average of monthly values over years is supposed to negate the influence of irregular component from monthly time series which is deflated by a correction factor to obtain seasonal monthly indices of market arrivals/prices. To assess the extent of intra-year price variation, the following two approaches along with the coefficient of variation have been employed as proposed by [8].

a) Intra – year price rise (IPR) = $\frac{\text{HSPI} - \text{LSPI}}{LSPI} \times 100$,

Where HSPI denotes Highest Seasonal Price Index and LSPI is the Lowest Seasonal Price Index

b) Coefficient of Average price variation = $\frac{\text{HSPI}-\text{LSPI}}{\frac{\text{HSPI}-\text{LSPI}}{2}} \times 100$

c) Coefficient of variation = $\frac{\text{Standard deviation}}{Mean} \times 100$

Results and discussion

At the outset, we examined the trend in market arrivals and prices of potato in five selected markets to ascertain a general direction of movement over the entire study period [Table-1]. The Table reveals that market arrival exhibits a positive trend in Champadanga market whereas the trend is negative in Dhupguri market. Rest of the markets show no definite trend of market arrival. The inter-year movement of harvest prices in all the markets show a positive trend except Dhupguri market where no definite trend is detected. Champadanga being basically a prominent assembling market surrounded by large production areas and equipped with large number of cold storages. As a result, with the increase in production, market supply is also progressively rising over the time. On the other hand, Dhupguri market though have the support of potato producing areas but the absence of adequate storage facility and also the movement of the produce to nearby markets may have rendered this market to experience negative trend in market arrivals. The arrivals of potato in Mawiong Regulated Market in Meghalaya was found to be negative (-8.36%) which may be due to the development of new markets nearby the farmers locality in the state [9].

Price shows an upward trend in all markets with varying magnitude and is significant at various levels except Dhupguri market where the trend is insignificant. The trend value is observed to be the highest in Memari market (Rs.7.27/Qtl./month) and Jhargram market has experienced the lowest value of Rs.5.95/Qtl./month. This rising trend in market price may be due to increase in demand arising out of increasing population, income, storing, processing etc. Price trend is affected by adjustment in supply arising out of development of cold storages and marketing facilities, production techniques and market arrivals over a long period of time [10].

An average monthly market arrival along with the variability is depicted in [Table-2]. The table discerns that Champadanga market has received the highest volume of potato during the lean month of August(188.40t) with minimum level of fluctuation measuring 11.85 per cent followed by September (177.60t) having monthly instability of 14.07 per cent and subsequently followed by the month of November (175.20 t and 34.17 percent). The lowest volume of market arrivals associated with the maximum value of fluctuation is recorded in the month of January which is accounted to be 38t and 51.64 per cent respectively. During the peak harvesting season, the average supply of potato is found to be maximum in the month of March (164.8 t) with variability of 50.99 per cent. This pattern of market arrivals in Champadanga market may be attributed to the fact that due to presence of large number of cold storages in the area, the farmers and traders are used to store a sizeable proportion of harvest in expectation of better prices during off-season. It also checks the distress sale of farmers during harvesting period. Dhupguri, Bishnupur and Memari markets have received higher volume of potato during harvesting or just after harvesting months from March to June with wide instability. The maximum quantity measuring 300.2 tones is received by Dhupguri market in March, the peak harvesting time, with highest level of variability of 126.76 per cent and the lowest arrivals is recorded in the month of December measuring 18.4 t with fluctuation of 44.92 per cent, although the fluctuation of market arrivals varies from 36.61 per cent in August to 126.76 per cent in March.

Table-1 *Trends in market arrivals and prices of potato of some selected markets of West Bengal*

Markets	Particulars	Intercepts	Coefficients	R^2
Champadanga	Market arrivals	126.39	0.479***	45.26
	Price	813.75	6.714**	52.19
Dhupguri	Market arrivals	180.27	-2.838*	38.21
	Price	805.34	3.33	44.35
Bishnupur	Market arrivals	88.01	-0.702	38.32
	Price	801.92	4.272***	35.93
Memari	Market arrivals	380.16	-2.432.	52.19
	Price	763.2	7.027**	43.77
Jhargram	Market arrivals	52.24	-0.793	49.58
	Price	797.51	5.954**	51.04

*, ** and *** indicates significance at 1, 5 and 10% level respectively.

The highest and the lowest market arrivals in Bishnupur market is noted in April (126.80t) with instability of 106.53 per cent and 30.60t in February, just prior to harvesting season, with variability of 51.86 per cent, respectively.

Memari market, being surrounded by large producing areas, has also witnessed maximum market supply during peak harvesting period of April (245.8t) followed by March(238t) with instability of 52.50 and 13.95 per cent respectively and the quantity of arrivals is found to be the lowest in October (75.2 t) with fluctuation of 46.77 per cent. The variability in market arrivals ranges from as low as 13.95% in March to as high as 87.33% in December which are relatively lower than Bishnupur market but higher compared to Champadanga and Dhupguri market. The higher level of market arrivals during harvesting/just after months may be due to inadequate availability of storage facility in the area or large quantity of distress sale arising out of low retention capacity of the farmers.

Market arrivals in Jhargram market is recorded to be the highest in January (68.40t) followed by February (65.20t) may be the result of harvesting of early sown potato crop in the nearby growing areas, but this quantum of arrivals is associated with wide fluctuation of 153.55 143.02% in the same order. During the rests of the months, the variability ranges from 16.67 (August) to 36.04 per cent (December).

Monthly average price of potato follows a uniform pattern across the markets starting from peak harvesting season (March) to the lean month of November to attain the maximum level exhibiting a continuous upward movement and again moves downward to reach the lowest level in February , just prior to the peak harvesting season with little variations from market to market [Table-3]. Champadanga market has experienced the lowest level of fluctuation in February (21.19%) and the highest value is noted in Bishnupur market during the month of October (64.68%). Here it is to be noted that the monthly instability in prices of potato is relatively less in comparison to that of market arrivals when all the markets are taken into consideration.

The seasonal indices of market arrivals and prices of potato ascertaining the long run seasonal variations demonstrates that higher indices of arrivals is observed in Champadanga market during August (158.89), in Dhupguri and Memari during March (184.58), the peak harvesting season, and in February at Jhargram(121.50) may be due to arrivals of early sown crop whereas in Bishnupur, the highest

seasonal indices is recorded in April (144.65), just after harvesting period [Table-4]. But all the markets have attained the highest seasonal indices of price in the month of November with varying magnitude except Jhargram market in which the highest seasonal price index is recorded in June(100.90).

The seasonal indices of market arrivals in Champadanga market is higher (more than 100) in March (105.98) and comes down to a lower level (less than 100) in April (43.04) and May (63.79), but shows a upward movement in successive months to reach the maximum in August and again, moves downward gradually in successive months to the lowest level in January (21.31).

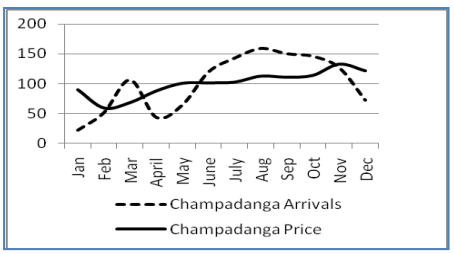
In Dhupguri, the market arrival index shows an increasing trend over the successive months starting from the lowest level in December (30.65) to the highest level in March (184.58) and declines gradually but remain higher than 100 up to July (102.75). Gradual down sliding continues to reach the lowest level in December.

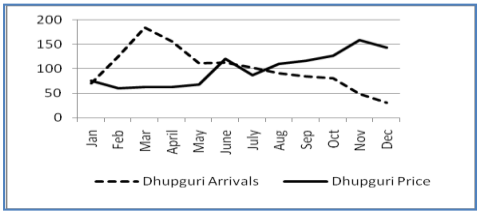
The behavioural pattern of market arrival in Bishnupur is somewhat different. After recording the highest seasonal index in April (144.65), it experiences a decreasing trend to mark the lowest in August (64.77) and again registers a upward trend till the month of December (103.35) and again moves downward to reach the lowest level in March (75.03), prior the peak harvesting period, i.e. a regular up and down movement of seasonal indices is observed in Bishnupur market.

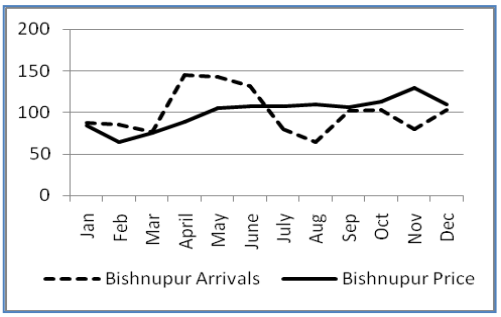
These indices for Memari market is exceptionally higher in March (751.46) and comes down gradually in successive months, though the minimum index value is noticed in October (24.54). In Jhargram, higher indices are recorded during January to March (more than 100) and exhibits a declining trend (less than 100) during April to July (from 96.41 to 85.72). Experiencing higher indices for only two months , i.e., in September and October, it starts moving downward to be the lowest in December (80.31).

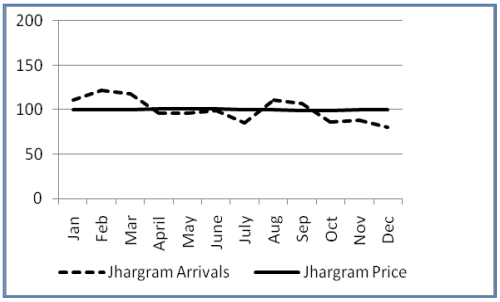
Summarily, seasonal indices of market arrivals show higher supply of potato during peak harvesting season in March and April as well as in lean season, particularly, during August to October months due to the existence of cold storages in general. The price movements also exhibits higher seasonal variation across the markets and months in the same market as evident from the seasonal price indices, but the extent of fluctuation is not as much as that of market arrivals. The visual depictions make it clear further [Fig-1]. Price movements in all the markets exhibit a gradual increase in successive months starting from the lowest level in February to the maximum in November with minor variations across the months and then starts declining to reach the lowest level in February except Jhargram market where the fluctuations in seasonal price indices are very negligible across the months.

The extent of intra-year price variation measured in terms of intra-year price rise (IPR), average seasonal price variation (ASPV) and co-efficient of variation (CV) portrayed in [Table-5] discerns that the maximum intra-year price rise is experienced by Dhupguri market (162.14%) followed by Champadanga (124.49%) and subsequently followed by Memari (108.57%) and Bishnupur(101.76%). In Jhargram market, the intra-year price rise is estimated to be only 1.68 per cent which is negligible compared to other markets.









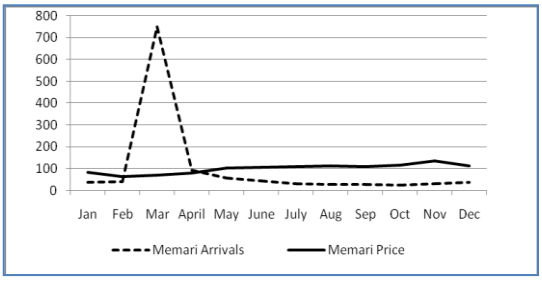


Fig-1

The pattern of average seasonal price variation across the markets is similar to that of intra-year price rise with difference in magnitude. The highest and lowest ASPV is recorded in Dhupguri and Jhargram with values 89.55 and 1.67 per cent respectively. But the ordering of the markets based on fluctuation in prices measured in terms of coefficient of variation presents a different order.

Though, Dhupguri retains its earlier position by registering the highest value of 48.21 per cent and Bisnupur and Memari markets come next in order by scoring a value of 42.22 and 42.03 per cent respectively. Champadanga occupies the fourth position with CV of 40.47 per cent in place of second position held in the previous to measures. Jhargram has maintained the same position by registering the lowest CV like that of two earlier measures.

Conceptually the market arrival is expected to be increasing function of prices whereas market price is expected to the decreasing function of market arrivals. In the present context, price of potato is negatively related with the market arrivals excepting Champadanga market where current price is positively related with the market arrivals. The negative relation is not uncommon in case of highly perishable vegetable crops like potato. The correlation coefficient between market arrivals and prices of cabbage, cauliflower, peas and tomato were negative [11]. The positive correlation between market arrivals and current prices in Champadanga market may be attributed to the existence of large number of cold storages and also the high retention capacity of the farmers may have enabled them to respond positively to price. On the other hand, one year lagged price of potato is negatively correlated with current prices across the markets which are presumed to be very common in case of vegetable crops. The lagged price of tomato gave high response and explained high variation indicating that lagged price of tamato is an important factor in determining the current prices [12, 13] also have reported that the lagged price of onion had a positive and significant correlation with their current prices but current prices had a negative correlation with the current arrivals.

Table-2 *Month-wise Variability in market arrivals of Potato in selected markets of West Bengal during period 2011-16*

Months	Champadanga		Dhupguri		Bishnupur		Memari		Jhargram	
	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
Jan	38.00	51.64	44.6	58.67	37.00	60.65	107.4	71.25	68.40	153.55
Feb	77.40	30.55	86.2	67.28	34.00	43.28	119.2	41.87	65.20	143.02
Mar	164.80	50.99	300.2	126.76	80.00	136.46	2380	13.95	25.20	24.04
April	60.60	28.31	205.4	106.62	126.80	106.53	245.8	52.50	20.60	28.22
May	92.00	28.43	86.6	50.76	108.00	102.77	165	26.34	20.60	29.65
June	149.00	22.22	81.6	36.26	100.80	97.68	128.4	42.15	19.60	24.09
July	167.60	22.48	80	43.15	48.60	102.84	93.2	58.60	20.40	22.09
Aug	188.40	11.85	71.4	36.61	30.60	51.86	80.8	65.96	22.20	16.67
Sep	177.60	14.07	66.2	41.15	53.40	122.19	86.4	51.06	21.40	20.26
Oct	170.60	18.12	57.4	39.01	57.00	123.76	75.2	46.77	18.40	29.92
Nov	175.20	34.17	32.8	45.34	46.80	89.07	85.8	67.34	18.20	31.90
Dec	102.60	31.17	18.4	44.92	76.20	91.00	104.6	87.33	16.60	36.04

Table-3 *Month-wise variability in prices of Potato in selected markets of West Bengal during period 2011-16*

Months	Champadanga		Dhupguri		Bishnupur		Memari		Jhargram	
	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
Jan	762.00	42.43	599.00	42.31	681.80	37.71	688.00	33.90	654.20	29.72
Feb	583.00	21.19	525.00	35.14	566.60	20.19	585.20	22.65	577.80	23.04
Mar	720.60	43.75	604.80	41.64	714.00	36.49	678.80	40.27	695.40	41.14
April	949.80	41.11	646.40	45.00	884.00	38.08	747.40	51.75	910.40	37.86
May	1082.80	36.05	738.40	51.76	1025.20	37.11	1049.60	35.69	1077.00	31.05
June	1106.20	36.73	895.80	49.72	1010.00	38.07	1081.40	36.26	1078.60	33.18
July	1124.40	40.64	957.40	52.75	1085.20	39.66	1108.80	39.91	1114.80	38.36
Aug	1183.60	42.16	1097.60	42.91	1122.80	43.14	1164.00	41.87	1123.40	37.67
Sep	1159.60	42.89	1116.60	33.08	1094.80	44.09	1154.00	42.55	1105.20	37.07
Oct	1191.40	39.58	1205.60	31.54	875.80	64.68	1205.00	37.14	1058.00	27.57
Nov	1269.40	25.55	1356.80	31.85	1192.60	31.12	1276.60	28.82	1247.20	33.25
Dec	1085.40	35.46	1136.60	40.66	933.80	33.53	991.60	34.07	1107.40	28.95

Table-4 *Seasonal indices of market arrivals and prices o potato in selected markets of West Bengal*

Months	Champadanga		Dhupguri		Bishnupur		Memari		Jhargram	
	Arrivals	Price	Arrivals	Price	Arrivals	Price	Arrivals	Price	Arrivals	Price
Jan	21.31	89.71	71.05	76.02	87.38	84.04	36.97	81.94	111.11	99.79
Feb	50.95	59.09	126.14	60.81	85.53	64.10	40.21	64.52	121.50	100.04
Mar	105.98	68.25	184.58	63.83	76.25	75.03	751.46	68.80	117.82	100.26
April	43.04	87.64	156.88	63.81	144.65	89.04	92.22	80.74	96.41	100.57
May	63.79	100.56	111.87	68.46	142.94	105.44	56.24	103.62	96.58	100.84
June	119.37	101.24	112.64	120.61	131.46	107.11	44.16	106.56	99.45	100.90
July	142.62	102.46	102.75	87.46	80.13	107.07	32.08	107.58	85.72	99.71
Aug	158.89	112.50	90.63	110.23	64.77	109.67	26.06	112.68	110.75	99.78
Sep	149.95	110.67	84.00	117.23	101.34	106.56	28.13	110.34	106.54	99.23
Oct	145.62	113.82	80.23	127.78	102.96	113.26	24.54	116.81	85.81	99.48
Nov	126.65	132.65	48.54	159.41	79.25	129.33	29.85	134.57	87.99	99.62
Dec	71.82	121.41	30.65	144.35	103.35	109.35	38.09	111.84	80.31	99.78

Table-5 *Intra-year price rise and Average seasonal price variation in selected markets of West Bengal*

Markets	IPR	ASPV	CV
Champadanga	124.49	76.73	40.47
Dhupguri	162.14	89.55	48.21
Bishnupur	101.76	67.45	42.22
Memari	108.57	70.37	42.03
Jhargram	1.68	1.67	37.95

Table-6 *Correlation coefficient between current prices and market arrivals as well as lagged prices of potato of West Bengal*

Markets	Correlation coefficient	
	current prices	lagged prices (one year)
Champadanga	0.112	0.01
Dhupguri	-0.223	-0.323
Bishnupur	-0.035	-0.16
Memari	-0.253	-0.334
Jhargram	-0.313	-0.223

Conclusions

The study on market arrivals and prices of potato in five markets of West Bengal indicates that the trend in market arrivals are negative in four markets, but the values are non-significant except Dhupguri and the lone Champadanga market experiencing positive significant trend. The positive and significant trend values of current prices are recorded in all markets barring Dhupguri where the trend is non-significant. Variability in market arrivals are observed to be the higher during peak harvesting season across the markets with minor deviation in Memari and Bishnupur markets and all the markets have received larger quantities of supply during /just after harvesting season except Champadanga where the peak arrival is in the month of August. Price fluctuation is found to be the higher during March to December compared to the rest of the periods, but the average prices have continuously gone up starting from harvesting months to lean season which is very common for highly perishable crops like potato. The study also points out that all the markets have attained the highest seasonal indices of price in the month of November except Jhargram. Seasonal indices of market arrivals and prices reflecting the seasonal movements follow similar pattern as that of average market arrivals and prices across the markets. Dhupguri market has experienced the maximum extent of price variability followed by Champadanga and subsequently followed by Memari and Bishnupur and the instability in prices is negligible in Jhargram market. The study also discerns that correlation between current prices

and market arrivals as well as lagged prices are negative and positive, respectively, in case of last four markets whereas in case of Champadanga market, the relationship is positive in both cases. From the study it is evident that establishment of scientific storage structure, dissemination of market information, pledge loan to check distress sale and constant watch on market arrivals and prices may reduce the extent of variability in market arrivals and prices which are necessary to protect the interest of both the producers and consumers.

Acknowledgement / Funding: Author are thankful to Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal-741252

Authors Contributions: All authors equally contributed

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of Interest: None declared

References

[1] Kainth G.S. and Mehra P.L. (1988) *Indian Journal of Agricultural Marketing*, 2(1), 113-120.
[2] Chatterjee S. and Kapur D. (2016) Understanding Price Variation in Agricultural Commodities in India: MSP, Government Procurement and Agriculture Markets, NCAER India Policy Forum, 2016.
[3] Sharma K.C. and Sharma A.K. (1996) *Bihar Journal of Agricultural Marketing*, 4(2), 132-143.
[4] Malik H.S, Chamola S.D. and Kaushik C.R. (1995) *Bihar Journal of Agricultural Marketing*, 3(2), pp.-185-89.
[5] Kalyankar S.P. and Rajmane K.D. (1987) *Journal of Maharashtra Agricultural Universities*, 12(1), pp. 88- 90.
[6] Sharma H.C, Dahiya P.S., Malhotra V.P. and Nayar N.M. (1987) *Financial Express*, July-23, p.-4.
[7] Arya A. (1995) *Bihar Journal of Agricultural Marketing*, 3(2), pp. 153-161.
[8] Acharya S.S. and Agarwal N.L. (1996) Agricultural Marketing in India, Oxford and IBH, Publishing Co. Pvt. Ltd, New Delhi.
[9] Singh R., Chauhan J., Singh K. J. and Saharan S.P. (2016) *Indian Res. J. Ext. Edu*. 16 (3), pp. 49-52.
[10] Mishra R. and Kumar D. A. (2012) *SAARC Journal of Agriculture*, 10(2), pp.107-120.
[11] Kumar V., Sharma H.R. and Singh K. (2005) *Agril. Econ. Research Review*, 18 (July-Dec.), pp. 271-291.
[12] Sharma R. (2011) *Journal of Farm Sciences*, 1(1), pp. 69-74.
[13] Alemahehu M. and Atteri B.R. (2000) *Agril. Econ. Research Review*, 13(2),144-50.