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Market Arrival and Price Behaviour of Potato in Tripura, India

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ABSTRACT

The study is undertaken in Tripura on a macro framework based on secondary data. There are eight districts in Tripura and potato is cultivated in all districts. Two districts viz., West Tripura and South Tripura districts are selected purposively based on higher and lower production. Accordingly, an effort is made in this study to examine the behaviour of arrivals and prices of potato in Tripura. Production of potato and the seasonality in production are the two important factors affecting the price. It observes that the area of potato has increased at the rate of 3.14 percent and 2.04 percent per annum in West and South Tripura districts respectively. Similarly, the production of potato has also increased at the rate of 3.36 percent and 2.45 percent in these two districts respectively. However, the productivity of potato in these two districts is positive but required to be improved to enhance the income of the farmers. It emerges out from this study that there is an inter-year variation in market arrival and prices of potato and variability in market arrivals is more pronounced than prices. Arrival remains on the higher side during January to March and consequently price indices remain low during this period and lower arrival indices coincides with the higher price indices during the lean season in the selected markets. The price indices remain much lower during the period of higher arrival in these selected markets. In view of results, it is suggested that there is a need for adoption of improved technologies in potato production in Tripura and at the same time efforts are required in extending the storage facilities and thereby seasonality of market arrivals and prices of potato may be minimised. Policy makers may give emphasis on price stabilization strategies to safeguard the interest of all stake holders associated with the potato marketing in Tripura.

HIGHLIGHTS

⊙ There is inter and intra year instability in the prices of potato in Tripura variability in market arrivals is more pronounced than prices

Keywords: Potato, price behaviour, arrivals, prices, seasonality

Vegetable sector is considered to be very important because it generates high income and employment, improve nutrition, protects and conserves the ecology (Kumar *et al*. 2005). Potato is the most important vegetable in India contributing to the extent of 21 percent in terms of area and 25.5 percent of total production of vegetables (Indian horticulture Database, 2014). Marketable surplus of potato is higher than other food crops but price fluctuations are more due to high perishability and seasonality. Higher price volatility in potato is a major concern for the farmers. Several findings have shown that potato prices fall every alternate year as a result of the market glut situation (Singh *et al*. 2017). Price volatility of potato is largely due to the changes in output and eventual changes in market arrivals (Latwal *et al*. 2017) and also because of supply disruptions. The supply disturbances tied with short-term demand and supply elasticity, contribute to sharp price fluctuations. The condition for vegetable growers is further exacerbated by lack of information on potential market as well as

potato arrival and price behaviour (Singh *et al*. 2017). Relatively inelastic demand for potato and higher price fluctuations at retail level lower the consumer welfare (Bera *et al*. 2017). Therefore, information regarding market arrival and price behaviour is very important for producer as it helps in finding out the best time for marketing to fetch higher profit (Thakare *et al*. 2017).

The area under cultivation of potato has increased remarkably during the plan period in Tripura. The trend in productivity is also encouraging at the event of prevalence of peasant production in the rural area. In spite of these encouraging performance, the producers not receive adequate incentive for their hard work and investment due to behaviour of the market. One important impediment to further improvement in respect of potato cultivation is the price fluctuations of potato in Tripura. It affects both the producer and the consumer by creating a wide difference between price received by the farmers and price paid by the consumers and ultimately squeezing the producer's share in consumer's rupee. In view of this, an effort is made in the present study to examine the nature and causes of price fluctuations and to suggest measures with a view to ensure the sustained improvement in potato cultivation in Tripura.

MATERIALS AND METHODS

The study is undertaken on a macro framework based on secondary data. Potato popularly known as 'The king of vegetables' is emerged as fourth most important food crop in Tripura. There are eight districts in Tripura and potato is cultivated in all districts. At first, all the districts are sub-divided into two groups i.e., higher production and lower production based on average production of the state. Accordingly, two districts viz., West Tripura and South Tripura districts in Tripura are selected purposively from lower and higher groups respectively. Two markets viz., Champaknagar from West Tripura and Shantirbazar from South Tripura are also purposively selected for this purpose. Price and arrivals of potato in relation to these selected markets are collected from Agmarknet. Trends in arrivals and prices are examined by using the monthly wholesale price and arrivals data from 2011 to 2020.

$$In(Price/Arrivals) = a + bTime + \mathcal{E}_t$$

$$Or\ Ln\ Y = a + tb + \varepsilon_t$$

Where, LnY = Real (market price) price/arrivals

t = Time (Years)

a = intercept

b = growth rate to be estimated

$\mathcal{E}_t$ = Error term

Assessment of seasonal pattern in prices and arrivals of potato is examined by constructing seasonal indices using ten-year averages.

Correlation coefficient 'r' as a means of market efficiency is analysed by the help of the following formula. The relationship between market arrivals and prices of potato in these selected markets is examined by employing Karl Pearson correlation coefficient technique using monthly data from 2011 to 2020. The correlation coefficient is employed by the following formula:

$$r = \frac{\Sigma XY - \dfrac{(\Sigma X)(\Sigma Y)}{N}}{\sqrt{\left(\Sigma X^2 - \dfrac{(\Sigma X)^2}{N}\right)\left(\Sigma Y^2 - \dfrac{(\Sigma Y)^2}{N}\right)}}$$

RESULTS AND DISCUSSION

Potato, like other agricultural commodities, is seasonal in nature and the arrivals of potato in the markets vary over the months in general. Cold storage also determines the pattern of arrivals which is ultimately reflected dependent on the behaviour of prices. Agriculture is characterised by wide fluctuation in the output of crops which subsequently lead to larger variation in market arrivals. Fluctuation in market arrivals largely influence to instability in prices. Therefore, there is a need to have an understanding of the price behaviour over time.

Area, production and yield of potato in West and South Tripura districts of Tripura during 2011-12 to 2020-21 are presented in Table 1. It reveals from Table 1 that the compound annual growth rate (CAGR) of area and production are positive and significant at 1% level in both these districts. It may be worthwhile to mention that both area

Table 1: Area, production and yield of potato in West and South districts of Tripura

Year	West District			South District		
	Area (000 ha)	Production (000 MT)	Yield (MT/ha)	Area (000 ha)	Production (000 MT)	Yield (MT/ha)
2002-03	1.900	36.312	19.11	2.350	48.880	20.80
2003-04	1.530	24.110	15.76	2.530	40.120	15.86
2004-05	1.253	23.918	19.09	2.393	44.487	18.59
2005-06	1.350	23.800	17.63	2.528	35.360	13.99
2006-07	1.350	27.675	20.50	2.645	53.429	20.20
2007-08	1.494	22.323	14.95	2.560	38.272	14.95
2008-09	1.510	23.027	15.25	2.590	38.827	14.99
2009-10	1.513	26.477	17.50	2.593	44.858	17.30
2010-11	2.029	37.285	18.38	2.431	43.720	17.98
2011-12	2.030	36.300	17.88	2.569	46.000	17.91
2012-13	2.439	43.756	17.94	3.073	56.850	18.50
2013-14	2.513	37.215	14.81	3.460	61.142	17.67
2014-15	2.419	42.671	17.64	3.846	67.843	17.64
2015-16	2.056	36.870	17.93	3.269	58.977	18.04
2016-17	2.179	39.151	17.97	3.166	57.436	18.14
2017-18	2.190	39.437	18.01	3.180	57.749	18.16
2018-19	2.200	39.617	18.01	3.184	57.821	18.16
2019-20	2.137	38.722	18.12	3.214	58.238	18.12
2020-21	2.562	47.345	18.48	3.330	61.538	18.48
2021-22	2.342	44.367	18.94	3.225	59.506	18.45
CAGR (%)	3.14*	3.36*	0.21[NS]	2.04*	2.45*	0.40[NS]

Source: Department of Agriculture & Farmers' Welfare, Govt. of Tripura; **Note:** CAGR = Compound annual growth rate; *significant at 1% level of significance; NS = non-significant.

and production in these districts have increased significantly over the years under reference. However, CAGR of productivity of potato is non-significant. This indicates that increase in production is occurred due to the increase in area over the years under reference. De *et al.* (2002) studied the cultivation of potato for true seed production in Tripura from 1984-85 to 1999-2000 and observed that the magnitude of area and production had increased significantly during these years. Similar findings were also reported by Pandey *et al.* (2005) in case of Uttar Pradesh and found that there was decline in annual compound growth rates in Uttar Pradesh due to increasing tendency of the farmers to early harvest crops for adjusting third crop in yearly cropping. This finding is in agreement with Singh *et al.* (2017) in respect of Uttar Pradesh, Kaur (2015), Bhajantri (2011) in case of Punjab and Karnataka respectively.

Variability in arrivals and prices of potato in Champaknagar (West Tripura) and Santirbazar

(South Tripura) from 2011 to 2020 is examined and presented in Table 2. It reveals that market arrival is at peak in 2015 in Champaknagar (West Tripura) market and in 2020 in Santirbazar (South Tripura) market with a mean of 39.66 quintals and 39.58 quintals respectively. It is lowest and appears at 19.65 quintals in 2020 in Champaknagar (West Tripura) market and 9.45 quintals in 2018 in Santirbazar (South Tripura) market. Year-wise market arrival shows that there is an inter-year variation during the period under reference. The coefficient of variation of arrival varies from 23.89 percent in 2020 to 64.11 percent in 2011 in case of Champaknagar (West Tripura), whereas it varies from 21.31 percent in 2013 to 108.10 percent in 2015 in case of Santirbazar (South Tripura). The market price is highest in 2020 in both these markets even there is a variation in market arrival in between these two markets. The average price varies from ₹ 1182.38 in 2017 to ₹ 3237.90 in 2020 in Champaknagar (West Tripura), whereas it varies from ₹ 961.01 in 2011 to ₹ 2807.44

Table 2: Yearly variability in arrivals and prices of potato in Champaknagar (West Tripura) and Santirbazar (South Tripura) markets during 2011-2020

Year	Champaknagar (West Tripura)				Santirbazar (South Tripura)			
	Arrivals (qt)		Prices (₹/qt)		Arrivals (qt)		Prices (₹/qt)	
	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)
2011	20.03	64.11	1268.68	20.76	13.84	24.51	961.01	15.48
2012	19.87	32.75	1330.41	20.66	24.61	78.24	1019.59	44.55
2013	24.90	27.90	1392.15	25.81	16.82	21.31	1122.98	15.33
2014	32.22	24.73	1653.29	36.71	9.46	59.65	1820.76	40.86
2015	39.66	37.21	1248.13	14.44	20.49	108.10	1440.34	54.99
2016	32.22	44.20	1997.66	26.31	12.17	74.95	1885.34	29.93
2017	25.17	34.88	1182.38	10.50	13.09	31.77	1187.57	20.69
2018	32.92	29.34	1725.57	17.53	9.45	26.98	1756.02	24.41
2019	24.76	64.04	1785.51	25.54	9.85	31.79	1432.02	21.19
2020	19.65	23.89	3237.90	26.09	39.58	52.74	2807.44	25.11
CAGR (%)	1.11[NS]	—	6.91**	—	0.37[NS]	—	8.36**	—

*Source: Agmarknet; **Note:** CAGR = Compound annual growth rate; **significance at 5% level of significance; NS = non-significant; C.V. = coefficient of Variation*

in 2020 in Santirbazar (South Tripura). Variation of price is highest (36.71 percent) in 2014 and lowest (10.50 percent) in 2017 in respect of Champaknagar (West Tripura). Price variation in case of Santirbazar (South Tripura) varies from 15.33 percent in 2013 to 54.99 percent in 2015. The CAGR of prices are 6.91 percent and 8.36 percent in case of Champaknagar (West Tripura) and Santirbazar (South Tripura) respectively and these are significant at 5% level of significance. However, the CAGR of arrival is positive but non-significant.

Seasonal variation in arrival and price of potato is a known fact and these are grossly accumulated due to the perishable nature of this particular crop which is basically determined by different human and organisational factors along with the climatic situation. There are several factors like weak bargaining power of the farmers, lack of storage facilities and high perishability and increasing demand for ready cash and lack of market intelligence sometimes induce farmers to sell their produce just after harvest. The price fluctuation of potato can bring a massive discomfort to marginal and small farmers as well as consumers. Accordingly, the monthly variability of arrivals and prices of potato in Champaknagar (West Tripura) and Santirbazar (South Tripura) are analysed and presented in Table 3. It is interesting to note that the mean monthly arrival of potato is considerably increased from 25.69 quintals in December to 37.55

quintals in February in Champaknagar (West Tripura) and 11.52 quintals in December to 31.36 quintals in March in Santirbazar (South Tripura) because a majority of the farmers in Tripura harvest potato during February to March. The mean arrival is lowest in October in both these markets. Mean market price is highest in November and lowest in February in case of Champaknagar (West Tripura) and it is highest in May and lowest in February in case of Santirbazar (South Tripura). The highest mean price varies from ₹ 1863.24 in Santirbazar (South Tripura) to 2081.58 in Champaknagar (West Tripura). The lowest mean price varies from 1048.38 in Santirbazar (South Tripura) to 1105.74 in Champaknagar (West Tripura). The coefficient of variation of arrival is highest and found to be 57.32 percent in August in Champaknagar (West Tripura) and 121.50 percent in June in Santirbazar (South Tripura). The coefficient of variation of prices is highest in November in case of Champaknagar (West Tripura) and in December in case of Santirbazar (South Tripura). However, this finding is not in agreement with Singh *et al*. (2017). They found that the variation in prices was highest in October.

Seasonal indices of arrivals and prices of potato in Champaknagar (West Tripura) and Santirbazar (South Tripura) markets during 2011-2020 are presented in Table 4. It reveals that in Champaknagar (West Tripura) market the seasonal arrival indices

Table 3: Monthly variability in arrivals and prices of potato in Champaknagar (West Tripura) and Santirbazar (South Tripura) markets during 2011-2020

Month	Champaknagar (West Tripura)				Santirbazar (South Tripura)			
	Arrivals (qt)		Prices (₹/qt)		Arrivals (qt)		Prices (₹/qt)	
	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)
January	37.27	39.37	1254.16	42.35	18.79	52.36	1210.18	36.95
February	37.55	39.71	1105.74	33.98	18.19	55.14	1048.38	30.68
March	28.14	41.78	1345.48	38.21	31.36	79.05	1210.00	33.46
April	30.47	34.61	1390.74	35.38	26.39	83.49	1219.73	33.42
May	32.00	34.59	1692.22	29.57	16.89	100.06	1863.24	44.60
June	22.91	29.82	1698.28	29.34	13.97	121.50	1676.69	36.94
July	21.83	16.58	1887.84	34.16	14.48	105.85	1814.78	34.62
August	23.21	57.32	1874.31	34.20	14.02	80.96	1762.87	43.14
September	20.82	38.55	2024.46	41.38	12.58	65.92	1688.54	44.44
October	19.34	42.48	2004.42	41.41	11.48	57.00	1676.95	48.62
November	26.47	49.97	2081.58	50.09	13.57	43.24	1808.29	57.12
December	25.69	53.67	1826.79	49.74	11.52	30.51	1540.05	60.49
CAGR (%)	-4.37*	—	5.35*	—	-6.52*	—	4.06*	—

*Source: Agmarknet; **Note:** CAGR = Compound annual growth rate; *significant at 1% level of significance; C.V. = Coefficient of Variation.*

Table 4: Seasonal indices of arrivals and prices of potato in Champaknagar (West Tripura) and Santirbazar (South Tripura) markets during 2011-2020

Month	Champaknagar (West Tripura)		Santirbazar (South Tripura)	
	Indices			
	Arrival	Price	Arrival	Price
January	137.32	74.56	110.94	78.41
February	138.35	65.73	107.35	67.93
March	103.68	79.98	185.15	78.40
April	112.28	82.68	155.76	79.03
May	117.91	100.60	99.70	120.73
June	84.40	100.96	82.48	108.64
July	80.42	112.23	85.50	117.59
August	85.52	111.42	82.74	114.23
September	76.70	120.35	74.24	109.41
October	71.27	119.16	67.79	108.66
November	97.53	123.74	80.11	117.17
December	94.64	108.60	68.00	99.79

Source: Agmarknet.

of potato is highest during February and lowest in October. The arrival indices are highest in March and lowest in October in Santirbazar (South Tripura) market. Arrival of potato remains on the higher side during January to March and consequently price indices remain low during this period and lower arrival indices coincides with the higher price indices during the lean season in case of Champaknagar (West Tripura) and Santirbazar (South Tripura) markets. In these two markets the price indices remain much lower during the period of higher arrival.

The inter-relationship between monthly arrivals and prices of potato in Champaknagar (West Tripura) and Santirbazar (South Tripura) markets are analysed employing Karl Pearson correlation coefficient technique using monthly data from 2011 to 2020 and exhibited in Table 5. It observes

Table 5: Correlation coefficients (r) between arrivals and prices of potato Champaknagar (West Tripura) and Santirbazar (South Tripura) markets during 2011-2020

Month	Champaknagar (West Tripura)	Santirbazar (South Tripura)
		Correlation coefficient (r)
January	-0.19	0.10
February	-0.31	0.38
March	-0.36	0.30
April	-0.44	0.36
May	-0.64*	0.14
June	-0.50	0.33
July	-0.11	0.55**
August	-0.33	0.55**
September	0.13	0.55*
October	0.19	0.47
November	0.11	0.55**
December	0.08	0.48

Source: Agmarknet; **Note:** ***, *significance at 10% and 5% level of significance respectively.*

that there is significant correlation between market arrivals and prices in the months of May, July, August, September and November and significant too at 10% and 5% level of significance. The possible reason may be due to arrival of potato is transpired from other areas during these months.

CONCLUSION

It has been observed in many studies that there is huge inter-year and intra-year instability in prices of potato in India. An effort is made in this study to examine the behaviour of arrivals and prices of potato in Tripura. Production of potato and the seasonality in production are the two important factors affecting the price. It is observed that the area of potato has increased at the rate of 3.14 percent and 2.04 percent per annum in West and South Tripura districts respectively. The production of potato has increased at the rate of 3.36 percent and 2.45 percent in these two districts respectively. However, productivity of potato in these two districts is positive but required to be improved to enhance the income of the farmers. It emerges out from this study that there is an inter-year variation in market arrival and prices of potato. It also reveals that variability in market arrivals is more pronounced than prices. Arrival remains on the higher side during January to March and consequently price indices remain low during this period and lower arrival indices coincides with the higher price indices during the lean season in the

selected markets. The price indices remained much lower during the period of higher arrival in these selected markets too. It has been observed that higher prices of potato induced the potato growers in Tripura to increase the area under potato next year resulting in the increased production and arrivals concurrently which ultimately leads to glut in the market and sharp decline in prices. Thus, cobweb type demand supply cycle may prevalent the potato production and marketing system which bring fluctuations in potato prices and at the same time have serious political implications. In view of these, there is a need for adoption of improved technologies in potato production in Tripura and at the same time efforts may be made in construction of storages and thereby seasonality of market arrivals and prices of potato can be minimised.

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