Research Paper

Arrival and Price of Potato in Assam: A Zonal Perspective

Sujata Baruah*, Udeshna Talukdar, Sangita Borah and Nivedita Deka

Department of Agricultural Economics, Assam Agricultural University, Jorhat, India

*Corresponding author: sujatabaruah1@gmail.com (**ORCID ID:** 0000-0002-0310-1339)

ABSTRACT

The present study was performed to analyse the growth rate and variation (instability) in arrival and price of potato in Assam. The study was conducted for five major markets and five zones of Assam. It was based on secondary data on daily market arrival and daily wholesale price of potato collected from www.agmarknet.com for the period 2010-2021. The trend of potato arrival was positively significant in Hojai market. The study observed that there was a positive growth rate in arrival of potato in almost all of the markets primarily after the harvesting months. The price of potato in Barpeta Road, Jorhat and Balugaon markets had exhibited a significant positive high growth rate in the month of January. The seasonality index for arrival had been high during the period December-March which is the main season of potato in Assam. The instability for arrival and price in Barpeta Road and Balugaon markets were much higher than the other markets. It is important to have proper storage facility to minimise the instability.

HIGHLIGHTS

◉ Hojai market depicted a significant trend in arrival and price of potato.
◉ CAGR was positive for arrival of potato in almost all of the markets while the price of potato in different markets had different natures of growth.
◉ The CDVI for arrival and price were higher in Barpeta Road and Balugaon markets.

Keywords: Arrival and price, Potato, Compound Annual Growth Rate, Cuddy-Della Valle Index, Seasonality

Agriculture makes a remarkable contribution to domestic sectors in Assam. It accounts for more than a third of income of Assam by employing about 69 percent of the workforce. Amongst various food crops, the state constitutes a fair share of potato production of India. The popularity of consumption of potato among the people of Assam is significant. According to a news report, the annual demand for potatoes in the state is around 40 lakh tonnes. However, the production of potatoes in Assam is around 11 lakh tonnes. Thus, in order to meet the demand, the potato is imported in the state from different markets of other states, viz. West Bengal, Uttar Pradesh, Punjab, etc. in India (Pandit *et al*. 2006). This leads to a variation in arrival and price in Assam. The seasonality index of arrival was observed to be the highest during the period December-March which is the main season for potato in India (Saha *et al.* 2020). Keeping this fact in view, there was a need to examine the growth and variation of potato arrival and price in different zones with respective selected markets of Assam.

MATERIALS AND METHODS

The present study was conducted for the selected five markets, namely Barpeta Road, Jorhat, Hojai, Balugaon, Fatak Bazar. The potato markets were selected from each of the five agroclimatic zones of Assam, namely, Lower Brahmaputra Valley Zone (LBVZ), Upper Brahmaputra Valley Zone (UBVZ), Central Brahmaputra Valley Zone (CBVZ),

Barak Valley Zone (BVZ) respectively. Only five agroclimatic zones were considered for the present study as data pertaining to the hills zone was inadequate. The markets were selected based on the data availability and market arrival of potato. The secondary data on daily market arrival and daily wholesale price of potato were collected from www. agmarknet.com. The study pertained to the period from 2010 to 2021.

Analytical Framework

The statistical techniques that had been used to achieve the objectives of the study:

Compound Annual Growth Rate

The growth rate was specified as the percentage change of a variable within a given period of time (Saha *et al.* 2020). Compound annual growth rate (CAGR) of arrival and price of potato for each month over the eleven-year period was estimated using the following growth model:

$$Y = ab^t \qquad \ldots(1)$$

where,

Y = Arrival/Price of potato for the year t (Arrival in Quintals and Price in ₹/ Quintal)

t = Time period (1,2,…, n) for each period

a = Constant/ Intercept

b = Growth coefficient = $1 + \dfrac{r}{100}$

where,

r = Percentage rate of compound growth rate of arrival and price of potato per annum

Log transformation of equation (1) was reduced to the following form:

$$log\ Y = log\ a + t\ log\ b$$

Percentage of compound annual growth rate had been calculated as: (Das and Mishra, 2020)

$$CAGR,\ r = \{Antilog\ (log\ b) - 1\} \times 100 \qquad \ldots(2)$$

Linear Trend

The linear model was used to estimate the trend in arrival and price of potato. The linear trend equation which is used for the study is:

$$Y = a + bt + e \qquad \ldots(3)$$

Where,

Y = Arrival/ price of potato (Arrival in Quintals and Price in ₹/ Quintal)

a = Intercept Coefficient

b = Regression Coefficient

t = Time period

e = Error term

Cuddy-Della Valle Index

Cuddy-Della Valle Index (CDV Index) was used to estimate the variability in arrival and price of potato. The coefficient of variation overestimated the level of instability in time-series data characterized by long-term trends; thus, the Cuddy-Della Valle index was used to correct the coefficient of variation (Krishan and Chanchal, 2014). The variability in arrival and price of potato was calculated using the following formula (Saha *et al.* 2020):

$$\text{C-D V Index} = CV \times \sqrt{1 - R^2} \qquad \ldots(4)$$

Where,

CV = Coefficient of variation = (Standard Deviation ÷ Mean) × 100

R^2 = Adjusted Coefficient of Determination

Seasonal Fluctuations

The seasonality in arrival and price of potato was studied using the ratio to moving average method. This method was selected as it was found to be the most satisfactory, flexible and widely used method over the other methods (Gupta and Kapoor, 2007). The seasonal index for different months was obtained by using the following formula:

Seasonal Index for i^{th} month =

$$\dfrac{\overline{X}_i}{\overline{X}} \times 100 \text{ (Reddy }et\ al.\ 2021) \qquad \ldots(5)$$

Where,

$\overline{X}_i$ = Average for the ith month for all the years

i = 1,2, …,12 for month January, February,…, December, respectively

$\overline{X}$ = Average of the monthly averages =

RESULTS AND DISCUSSION

Trend analysis of arrival and price of potato

The trend was examined for the arrival and price of potato in the selected five markets of Assam to establish a general pattern of the behaviour over the period 2010 to 2021. From table 1, it was revealed that the Hojai market had exhibited a significantly positive trend in market arrival during the study period. Fatak Bajar market had shown a positive trend in the arrival. Barpeta Road market, Jorhat market, and Balugaon market had exhibited a decreasing trend in the market arrival.

On the other hand, it was revealed that the price in the markets had an increasing trend. The trends were significant at various levels for Hojai and Fatak Bajar markets except for Barpeta Road, Jorhat and Balugaon markets where the trend was insignificant. The trend in price was observed to be the highest for Balugaon market (₹ 82.22/Quintal/month) followed by Hojai market (₹ 31.75/Quintal/month) and was the lowest for Jorhat market (₹ 11.33/ Quintal/month). The trends in price were affected by adjustment in supply arising out of development of cold storages and marketing facilities, production techniques and market arrival over a period of time (Mishra and Kumar, 2012).

Growth and Instability in arrival and price of potato

The growth rate of arrival and price of potato for five markets of Assam are presented in table 2. It was observed that Barpeta Road market had shown a significant and positive growth rate in the month of January (1.74%) and a positive growth rate in the months of March (9.41%), and June (0.76%) only. The growth rate of arrival was negative for the rest of the months.

Table 1: Trends in arrival and prices of potato

Market	Arrival		Prices	
	Intercept	Coefficient	Intercept	Coefficient
Barpeta Road (LBVZ)	4870.84	-135.92	1003.78	11.84
Jorhat (UBVZ)	13172.63	-132.33	1119.12	11.33
Hojai (CBVZ)	168.60	3.81 *	1149.35	31.75 ***
Balugaon (NBPZ)	105.02	-0.91	634.02	82.22
Fatak Bajar (BVZ)	504.21	3.79	1068.32	19.96 *

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

Table 2: Monthly Compound Annual Growth Rate (CAGR) of arrival and price of potato

Months	Markets									
	Barpeta Road (LBVZ)		Jorhat (UBVZ)		Hojai (CBVZ)		Balugaon (NBPZ)		Fatak Bajar (BVZ)	
	Arrival	Price	Arrival	Price	Arrival	Price	Arrival	Price	Arrival	Price
January	**1.74***	**36.14***	4.58	**21.00****	30.26	16.81	4.57	**29.67***	13.71	14.88
February	-1.62	24.80	**2.58***	**-0.50***	1.45	1.50	-1.10	**10.32****	4.28	4.28
March	9.41	7.67	-2.43	-2.81	0.26	1.84	-0.49	**6.88***	2.25	3.55
April	-0.43	-16.62	-1.97	1.31	-0.06	**1.34***	**-0.47***	5.36	-1.18	-0.50
May	-9.31	-5.90	**-1.87***	0.02	-0.08	1.25	**-0.01***	4.18	-1.03	-0.16
June	0.76	-1.50	**-1.20***	0.24	0.37	**1.34***	-0.12	**3.28***	-0.99	0.12
July	-9.29	3.74	**-1.09***	0.66	1.01	**1.58****	-0.43	2.84	-0.57	0.46
August	**-10.78***	3.58	**-1.35***	0.74	1.68	**1.85***	-9.97	2.95	-0.33	**0.63***
September	**-1.87****	2.85	**-1.11***	0.66	2.42	3.10	-0.57	2.24	0.01	0.65
October	-3.06	2.66	**-2.22***	1.66	2.46	2.53	3.93	18.45	1.61	2.59
November	**-2.39***	2.25	**-1.39***	0.87	2.42	2.56	-3.95	4.00	1.66	**2.80***
December	**-0.26***	2.42	0.32	1.50	**2.48***	2.53	-0.38	**2.21***	1.14	**1.82***

*indicates significance at 10% level, **indicates significance at 5% level.*

The instability for the arrival and price of potato in the five major markets of Assam are presented in table 3. It was evident from table 3 that there was a greater instability (Krishan and Chanchal, 2014) in the market arrival of Barpeta Road market (27.62%).

Table 3: Instability of market arrival and price in all markets

	CDVI Index (%)	
Markets	**Arrival**	**Price**
Barpeta Road (LBVZ)	27.62	26.86
Jorhat (UBVZ)	7.24	7.55
Hojai (CBVZ)	9.78	5.76
Balugaon (NBPZ)	25.40	70.29
FatakBajar (BVZ)	8.84	9.23

It was found (table 2) that the growth rate of arrival in Jorhat market was the highest in the month of January (4.58%). A significantly positive growth rate was observed in the month of February (2.58%) which might be due to the availability of the local product in addition to the export from other states. A positive growth rate was found in December (0.32%). The instability in the growth rate of arrival (from table 3) in Jorhat market was comparatively lower (7.24%).

The growth rate of market arrival in Hojai market was the highest in the month of January (30.26%) and a significantly positive growth rate was observed in December (2.48%) with a less instability of 9.78% in the arrival.

The growth rate of arrival in Balugaon market was the highest in January (4.57%). A gradual negative growth rate of arrival in the market was recorded. The market was observed to have a high instability of 25.40 in the arrival which might be due to the lack of proper cold storage facilities and the movement of the local farmers to sell their product in the nearby areas/markets.

The growth rate of arrival was found to be the highest in January (13.71%) in Fatak Bajar market. The instability in arrival in Fatak Bajar market was observed to be less (8.84%).

The monthly growth rate of price was found to follow a certain pattern across all the markets (Bera *et al.* 2017). The growth rate of price was recorded the highest in the beginning months of the year which was tended to decrease in the mid-year was

followed by an unsteady increase towards the end of the year.

The growth and instability of arrival and prices of potato in the five zones Lower Brahmaputra Valley Zone (LBVZ), Upper Brahmaputra Valley Zone (UBVZ), Central Brahmaputra Valley Zone (CBVZ), North Brahmaputra Valley Zone (NBVZ) and Barak Valley Zone (BVZ) of Assam for the period 2010-2021 are presented in table 4.

Table 4: Growth and instability of arrival and price of potato in zones of Assam during 2010-2021

Zones	Arrival		Price	
	CGR	**CDVI Index (%)**	**CGR**	**CDVI Index (%)**
LBVZ	-16%	84.18	6% *	28.04
UBVZ	7%	129.15	8% *	36.26
CBVZ	-14%	92.34	7% *	37.65
NBPZ	-13%	77.48	17% **	51.01
BVZ	-24% *	49.73	14%	53.13

*indicates significance at 10% level, **indicates significance at 5% level.*

From table 4, it was revealed that LBVZ, CBVZ, NBVZ and BVZ of Assam exhibited a negative growth rate in arrival of potato except UBVZ which had exhibited a low positive growth rate in arrival during the period 2010 – 2021. It was also seen that there was a high instability (129.15%) in arrival of potato in the markets of UBVZ and this might be due to the pandemic crisis.

Moreover, it was observed that all of the zones except the BVZ had exhibited a positively significant growth rate in the price of potato. The exceptional case that was observed in BVZ might be due to a high instability (53.13%) in the price in the respective zone.

Seasonality in arrival and price of potato

The monthly seasonal indices of arrival and price of potato for the five major markets in Assam are presented in table 5.

Seasonal indices of arrival and price of potato in Assam (table 5) had revealed that the seasonal arrival index for Barpeta Road market was the highest during the month of March (154.76) and the lowest during August (47.44) due to the postharvest season. The Barpeta Road market had low seasonal

Table 5: Seasonal indices of arrival and price of potato

Months	Barpeta Road (LBVZ)		Jorhat (UBVZ)		Hojai (CBVZ)		Balugaon (NBPZ)		Fatak Bajar (BVZ)	
	Arrival	Model price	Arrival	Model price	Arrival	Model price	Arrival	Model price	Arrival	Model price
January	120.20	115.73	111.91	113.17	113.86	100.13	110.05	80.28	108.37	103.19
February	114.34	132.39	112.61	92.59	89.96	88.32	102.93	75.35	103.63	97.69
March	154.76	106.10	99.41	85.86	88.08	90.54	103.72	75.58	101.87	99.74
April	116.12	41.08	98.83	98.52	87.21	90.40	103.26	76.27	90.88	88.04
May	72.48	62.73	97.35	93.63	87.08	91.21	105.21	75.96	90.49	89.11
June	123.61	77.64	99.54	94.88	89.34	92.83	104.50	75.11	89.79	90.50
July	59.69	109.91	99.08	97.94	93.76	95.66	102.11	75.34	91.57	92.78
August	47.44	112.61	96.01	99.21	99.83	99.25	45.42	78.10	92.81	94.49
September	99.70	109.48	96.77	99.25	108.40	112.81	99.95	75.57	95.39	95.19
October	86.60	110.52	85.49	110.31	111.45	110.04	154.78	336.63	111.76	115.97
November	90.58	108.57	91.75	102.84	113.76	113.17	67.54	95.32	114.22	121.73
December	114.49	113.25	111.24	111.79	117.28	115.64	100.53	80.49	109.21	111.58

price index during April – September due to lean season of potato at the place. Seasonal arrival index for Jorhat market was the highest during January – February and exhibited a gradually decreasing seasonal price index during those months which was in support of the law of supply and demand. The seasonal indices of potato in Hojai market had shown almost a similar pattern. Seasonal arrival index of potato in Balugaon market was the highest in the month of October which also had shown a higher seasonal price index and this might be due to the pandemic crisis. Table 5 had shown that Balugaon market and Fatak Bajar market had performed a similar pattern of the coincidence of high seasonal arrival indices and low seasonal price indices during the months of January – March. Seasonal arrival index of potato in Fatak Bajar market was the highest during November which had a high seasonal price index at the same period.

CONCLUSION

The study revealed that the trend in arrival of potato was negative but non-significant in four of the markets except Hojai market which had shown a positively significant trend. It had been revealed that the trend in the price of potato was positive and significant in Hojai market and Fatak Bajar market except for the other three markets, namely Barpeta Road market, Jorhat market, and Balugaon market where the trend in price was non-significant.

The study also discerned that there was a positive growth rate in the arrival of potato in almost all of the markets primarily after the harvesting months, i.e., January to March. The price of potato in different markets had exhibited different natures, in some markets, it was found to show positive growth while in others it had shown negative growth. As the price was one of the most volatile factors, fluctuations in growth had been expected to appear. The study showed that the NBVZ has exhibited a negative growth rate in arrival with a highly significant and positive growth rate in price which might be due to the fact that despite of containing major potato-producing areas the major markets are lacking proper storage facilities. It had the possibility to create a quantitative loss in the production stage because of the perishable nature of potato leading to less arrival in the market and consequently, an increase in the price. The seasonality index for arrival had been high during the period December-March which is the main season of potato in Assam as well as in the plains of India. The seasonality index for the price is observed to be the highest when the arrival is low. The CDV index for arrival and price in Barpeta Road and Balugaon markets were much higher than the other markets which might due to the reason that as there was a high instability in the arrivals, this led to greater variations in the price in order to fulfil the demand in the markets.

REFERENCES

Bera, B., Dutta, J. and Nandi, A. 2017. A Study on the Variability in Market Arrival and Price of Potato in Some Selected Markets of West Bengal. *Int. J. Agric. Sci.*, **9**(40): 4621-4625.

Das, A. and Mishra, R.R. 2020. Compound Annual Growth (CAGR) Rate of Fresh Tea Leaf (*Camellia sinensis*) production in Assam: A Statistical Approach. *Food and Scientific Rep.*, **1**(1): 50-54.

Gupta, S.C. and Kapoor, V. . 2007. Fundamentals of Applied Statistics. Pp: 2.2-2.9. Sultan Chand & Sons, New Delhi.

https://assam.gov.in/about-us/393

https://www.google.com/amp/s/www.sentinelassam.com/amp/topheadlines/potato-imports-cost-assam-rs-4500-crore-yearly-579152

Krishan, B. and Chanchal, A. 2014. Agricultural Growth and Instability in Western Himalayan Region: An Analysis of Himachal Pradesh, India. *J. Agric. and Life Sci.*, **1**(1): 21-27.

Mishra, R. and Kumar, D.A. 2012. Price behaviour of major vegetables in hill region of Nepal: an econometric analysis. *SAARC J. Agric.*, **10**(2): 107-120.

Pandit, A., Pandey, N.K., Rana, R.K., Kumar, N.R. and Deka, C. 2006. Production and Marketing of Potato in Barpeta District of Assam. *Indian J. Agril. Market.*, **20**: 100-110.

Reddy, G.R., Reddy, M.C., Sneha, K.S., Gita, B.M. and Ramesh, D. 2021. Economic Analysis of Price and Arrival of Turmeric in Duggirala Market of Andhra Pradesh. *Int. J. Econ. Plants*, **8**(1): 019-024.

Saha, N., Kar, A., Jha, G.K., Venkatesh, P. and Kumar, P. 2020. Market Arrival and Price Behaviour Analysis of Potato in Four Major Markets in India. *Econ. Aff.*, **65**(4): 529-533.