

# Production behaviour of potato in Assam- A critical analysis across zones and size groups of farms

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## ABSTRACT

Potato is one of the most important and widely cultivated vegetable crops of Assam and ranks fourth in terms of acreage under individual crop in the state. A study on Production behaviour of potato across size groups, districts and zones of Assam was conducted using data pertaining to Agricultural year 2013-14. The result of the study revealed that per hectare potato cultivation cost was found to be highest in LBVZ (Lower Brahmaputra Valley Zone) ₹ 70362.08 followed by CBVZ (Central Brahmaputra Valley Zone) ₹ 70357.07, UBVZ (Upper Brahmaputra Valley Zone) ₹ 70238.78 and NBPZ (North Bank Plain Zone) of Assam ₹ 69755.20 respectively. It was also observed that with increase in size group of farms area allocation under the crop also increased as a result cost of production of potato also recorded an increasing trend in all the zones of the state. This trend of increased area allocation across size groups the degree of commercialization of potato had also increased and productivity of the crop was found increasing gradually from size group I farmers to size group III farmers. Potato production in all the zones reflected that in LBVZ of Assam, from 1987 to 1997 witnessed sharp decrease in potato production. After 1994 till 2004 potato production was moving in upward direction due to incorporation of latest production technologies in the farmers field. Potato production in the CBVZ of Assam was found to be more or less unchanged during the whole period. In UBVZ it was reflected that from 1993 till 2003 potato production was found to be stagnant. After that it was showing upward movement. Similarly, in NBPZ also the potato production was found to be more or less stationary during the whole period.

**Keywords:** Production, size group of farms, potato, assam

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Potato has emerged as fourth most important food crop in India after rice, wheat and maize. Indian vegetable basket is incomplete without Potato. It has been observed that during present trend of diversification from cereals to horticultural crops, shifting from wheat/ barley cultivation to potato cultivation is economically rewarding owing to comparative advantage of potato over other vegetable crops. Potato cultivation is highly

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adaptable to a wide variety of farming systems. With its short vegetative cycle and high yields within 100 days, it fits well into double cropping systems with rice, and is also suitable for inter cropping with maize and soy beans. India's potato production has seen a phenomenal increase since the 1950s, mainly due to strong demand from the processing industry and remunerative returns. According to the Central Potato Research Institute (CPRI), the area under potato rose by almost 547 per cent since the 50s, while yield rose by 267 per cent and overall output jumped by 146 per cent. It produces 74.5 and 58.0 per cent more food energy and 54.0 and 77.6 per cent more protein per unit area than wheat and rice respectively (Lisinska and Leszczynski, 1989). India produced 42.34 million tons from 1.86 million ha with an average yield of 22.72 t/ha of potato during 2010 to 2011 (Agricultural Statistics at a Glance, 2012).

Potato is one of the most important and widely cultivated vegetable crops in Assam and ranks fourth in terms of acreage under individual crop in the state. Bhattacharyya *et al.* (2001) reported that in Assam the potato acreage has increased by 222.65 per cent in 1997-98 over 1962-63. However, the yield of the crop is rather low (only 8 t/ha against national average of 19 t/ha) in Assam. As a result it has to import potato from neighbouring states like West Bengal, Meghalaya and even U.P and Punjab every year owing to huge gap between demand and supply. Price is the most important determinant of profit or loss in any farm enterprise. When market price is favourable in relation to cost, it leads to profit and provides incentive to producers to grow more. Hence the short-run changes in prices and their effect on production behaviour have been receiving a great deal of attention. A more effective formulation of agricultural policy is needed for developing economy where a systematically planned and rationally phased development is being attempted. Hence, in order to bring about sustained and balanced economic growth, it is very important to understand the long-run effect of prices on production. That is why the role played by the government by way of price fixation and market operations must be based on the knowledge of how precisely the producers respond to prices. On the whole, an appropriate price policy is crucial for the growth and stability of production. Although the new

technology has been an important vehicle for increasing agricultural productivity, but at the same time the variability of production and productivity seems to have increased due to uneven adoption of technology and thus created inter and intra regional disparity. So the cropping pattern and production behaviour of potato crop undergo change in course of time being influenced by number of factors such as price, productivity and technological improvement etc. The present paper examines the Production behaviour of potato in Assam across zones and size groups of farms

#### **DATABASE AND METHODOLOGY**

The study was conducted in Brahmaputra Valley Zone of Assam and data pertained to the Agricultural year 2013-14. Multistage Stratified Proportionate Random sampling technique was used to select the commercial potato growers in the study area. The farmers of the selected villages were listed and they were categorized under three groups, *viz.* marginal (Size Group I, below 1 ha) small (Size Group II, 1.00 to 2.00 ha) and semi medium (Size Group III, 2.00 to 4.00 ha) based on their operational holding. In the area under study no farms belonging to medium and large size categories were available. Finally, 10 per cent of sample households from each size group were selected randomly from each zone without replacement for detail investigation. This formed a random sample of 480 numbers comprising of 200 marginal farmers, 148 small and 132 semi medium size group of farms. The primary data for the year 2013-14 were collected with the help of a specially designed pre tested schedule and questionnaire through personal interview. Secondary data were collected from various sources like Department of Agriculture, Offices of Agricultural Marketing Officers, Assam State Agricultural Marketing Board, Directorate of Economics and Statistics and various published and unpublished sources.

The cost of cultivation has been worked out by using the standard cost concepts as defined and used in economies of farm management for estimation of the cost of cultivation as under.

- (i) Variable cost = All costs incurred in cash or kind on all material inputs, hired human labour, interest on working capital.

- (ii) Cost  $A_1$  = All variable costs + other miscellaneous charges.
- (iii) Cost  $A_2$  = Cost  $A_1$  + Rental value of leased in land
- (iv) Cost B = Cost  $A_2$  + Rental value of own land
- (v) Cost C = Cost B + Imputed value of family labour.

The gross income, income over variable cost, net income, farm business income and family labour income have been worked out as follows:

- (i) Gross income = the gross income was computed by multiplying the output or quantity of produced by price.
- (ii) Farm Business income = Farm business income was calculated by deducting Cost  $A_2$  from gross income
- (iii) Family labour income = It was computed by deducting Cost B from gross income
- (iv) Net income = Net income was calculated by deducting Cost C from gross income.

The resource use efficiency of potato was studied through production function of the Cob-Douglas type, which was found appropriate for the present study on economic and statistical grounds.

The functional form: As analytical tool Cobb-Douglas type of production function was used to examine the resource productivity in potato cultivation.

$$Y_1 = Ax_1^{a_1}x_2^{a_2}x_3^{a_3}x_4^{a_4}x_5^{a_5}e^u$$

$$\text{Or, } \log Y_1 = \log A + a_1 \log x_1 + a_2 \log x_2 + a_3 \log x_3 + a_4 \log x_4 + a_5 \log x_5 + u$$

Where,

- $Y_1$  = Yield of potato crop (q)
- $x_1$  = Expenditure on Labour (Rs)
- $x_2$  = Expenditure on seed (Rs)
- $x_3$  = Expenditure on fertilizer (Rs)
- $x_4$  = Expenditure on ploughing (Rs)
- $x_5$  = Expenditure on plant protection measure (Rs)
- $u$  = Error term
- $a_1, a_2, \dots, a_5$  = Unknown parameters estimated with OLS method

To study the variation in potato production co-efficient of variation and moving CV was undertaken.

CV =	SD Mean	× 100
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Where,

CV = Co-efficient of variation

SD = Standard Deviation

Moving co-efficient of variation of potato production was worked out by adding one year and leaving one year data for three years and the same was done for the consecutive years simultaneously.

### RESULTS AND DISCUSSION

Potato is one of the important cash crops grown in the Brahmaputra Valley Zone of Assam. Well-drained sandy loam and loam soils, rich in organic matters are suitable for cultivation of potatoes. The ideal time for potato cultivation is from middle of October to middle of November. Seeds, fertilizers and pesticides are available at local seeds agencies. Maturity of potato crop is 110 to 120 days and the average yield is 175 - 225 quintals per hectare. Table 1 clearly revealed that per hectare potato cultivation cost was highest in LBVZ of Assam (₹ 70362.08) followed by CBVZ (₹ 70357.07), UBVZ (₹ 70238.78) and NBPZ (₹ 69755.20) respectively. In case of gross income of the farmers it was observed to be highest for LBVZ (₹ 124032.20) followed by NBPZ (₹ 123984.50), UBVZ (₹ 123726.70) and CBVZ (₹ 123718.00). Likewise Net Income was observed to be highest for NBPZ (₹ 54229.27) followed by LBVZ (₹ 53670.16), UBVZ (₹ 53487.92) and CBVZ (₹ 53360.95) of Assam. Farm Business Income was recorded to be highest for NBPZ (₹ 58635.94) followed by LBVZ (₹ 58317.23), UBVZ (₹ 57817.92) and CBVZ (₹ 57768.25), respectively. Similarly, Family Labour Income was observed to be highest for NBPZ (₹ 55752.61) followed by LBVZ (₹ 55460.16), UBVZ (₹ 54947.92) and CBVZ (₹ 54849.62). The B: C ratio was also observed to be highest for NBPZ (1.78:1) and the lowest was observed for CBVZ (1.75:1), while for both LBVZ and UBVZ the estimated B: C ratio was (1.76:1). The B:C ratio revealed that benefit derived from potato cultivation was rather low which could be attributed mainly to lower yield of crops across size groups in all

the agro climatic zones of the state. The soil condition and availability of labour in these zones helps to get better returns from the potato crop. But in UBVZ most of the farmers preferred to invest in tea plantation than other commercial crops which might be one of the reasons for not adopting modern production technologies in potato cultivation. Non availability of farm labours at proper time was found to be another important reason for less expansion of commercial potato growers in UBVZ of Assam.

It was reflected from Table 2 that the coefficient of multiple determinations,  $R^2$  ranged from 0.96 in size group II to 0.97 in size group I and size group III farms. It suggested that variable included in the function could explain 96 per cent to 97 per cent of total variation in production of potato crop in the study areas. It was observed that regression coefficients of expenditure on labour were found positive and significant in all the size groups (0.66, 0.39 and 1.28). This indicated that labour was the main factor of production in case of all the size groups of LBVZ of Assam. The expenditure on seed was found positive and significant for size group I (0.15) farmers of the zone while in other size groups the expenditure on seed was not found to be significant. This might be due to the fact that size group I farmers were small farmers and they do not store potato for next season as a result they always need to buy potato seed from the market for cultivation and the fresh good quality potato has greater impact on potato production. Expenditure on fertilizer was found to be positive and significant for all the size groups of farmers (0.22, 0.02, and 0.16) in LBVZ of Assam. The expenditure on fertilizer was found positive and significant for pooled group (0.04) also. This indicated that farmers were following the recommended doses of fertilizers application in potato farming. This leads to better production from the crop in the zone. It was observed from the Table that expenditure on machinery was found significant for size group I (0.17) and size group II (0.23) farmers. But the expenditure on machinery was not found significant for size group III farmers. This might be due to the fact that with increase size groups of farmers' expenditure on machinery increases simultaneously. Expenditure on plant protection measures was found significant for

size group I (0.16) farmers of LBVZ. But the expenditure was not found significant for other size groups in the zone. This indicated that pest and disease control by size group I farmers were found somewhat easier than the other groups due to increase sizes of farms in other size groups. Hence, required amount of expenses in Potato farming leads to better production and returns in different size groups of farmers in LBVZ of Assam.

Table 3 reflected that the coefficient of multiple determinations,  $R^2$  was found 0.98 in all the size groups of the zone. It suggested that variable included in the function could explain 98 per cent of total variation in production of potato in the study areas. It was observed that regression coefficients of expenditure on labour were found positive and significant for size group I (0.11) and size group II (0.05) farmers. On the other hand it was not found significant for size group III farmers. It was indicated from the analysis that incorporation of family labour had enough contribution in the production of potato in size group I and II farmers, while for size group III farmers expenditure on labour increases with increase area under the crop. The expenditure on seed was found positive and significant for size group III (0.86) farmers of the zone while in other size groups the expenditure on seed was not found significant. This might be due to the fact that size group III farmers were incorporating high yielding varieties of potato in their farming. Expenditure on fertilizer was found positive and significant for all the size groups I (0.09) and size group III (0.86) farmers in CBVZ of Assam. On the other hand the expenditure on fertilizer was not found significant for size group II farmers. This indicated that large farmers were following the recommended doses of fertilizer application in potato farming as they were incorporated high yielding varieties for better production.

It was observed from the Table 4 that coefficient of multiple determinations,  $R^2$  ranged from 0.96 in size group I to 0.98 in size group III farmers. It suggested that variable included in the function could explain 96 per cent to 98 per cent of total variation in production of potato crop in the study areas. It was observed that regression coefficient of expenditure on labour was found positive and significant only for size group

Production behaviour of potato in Assam- A critical analysis across zones and size groups of farms

II (0.25) farmers in the zone, while for size group I (0.01) and size group III (-0.04) farmers the regression coefficients was not found significant. This was indicated that proper utilization of labour including family labour was found in size group II farmers, on the other hand proper utilization of labour was not found in size group I and size group III farmers. As farm labour availability in UBZ is very low as a result large farmers cannot get required numbers of labours to incorporate in potato farming.

The regression coefficient of expenditure on seed was found positive and significant for size group III (0.36) farmers. But the expenditure on seed was not found significant for size group I and size group II farmers. This might be due to the fact that large farmers were usually go for high yielding varieties for cultivation which leads to better production in the later period.

**Table 1:** District and zone-wise cost of cultivation of potato in Brahmaputra Valley Zone of Assam (in Rs. per ha/year)

District	CostA1	CostA2	Cost B	Cost C	Gross Income	Net Income	Farm Business Income	Family Labour Income	B:C ratio
Barpeta	64816.34	65151.34	67673.00	69463.00	124652.60	55189.60	59836.27	56979.60	1.79:1
Kokrajhar	66544.35	66879.35	69400.35	71188.35	123692.40	52504.07	57148.07	54292.07	1.74:1
Goalpara	65380.05	65715.05	68236.05	70022.05	124275.80	54253.76	58895.76	56039.76	1.77:1
Dhubri	65886.44	66221.44	68742.44	70530.44	123654.90	53124.41	57768.41	54912.41	1.75:1
Kamrup	65760.55	66095.55	68616.55	70404.55	124937.30	54532.73	59176.73	56320.73	1.77:1
Nalbari	66016.03	66351.03	68872.03	70660.03	124144.50	53484.44	58128.44	55272.44	1.75:1
LVBZ	65715.01	66050.41	68572.08	70362.08	124032.20	53670.16	58317.23	55460.16	1.76:1
Nagaon	65949.77	66294.07	68868.41	70357.07	123718.00	53360.95	57768.25	54849.62	1.75:1
CBVZ	65949.77	66294.07	68868.41	70357.07	123718.00	53360.95	57768.25	54849.62	1.75:1
Dibrugath	65928.81	66261.81	68797.81	70257.81	123633.00	53375.19	57704.19	54835.19	1.76:1
Jorhat	65882.53	66222.53	68758.53	70318.53	123538.50	53219.97	57655.97	54779.97	1.75:1
Sivasagar	64780.53	65114.53	67650.53	69110.53	122433.4	53322.90	57652.90	54782.90	1.77:1
UBVZ	65908.78	66242.78	68778.78	70238.78	123726.70	53487.92	57817.92	54947.92	1.76:1
Darrang	65226.87	65571.87	68106.87	69806.87	123768.00	53961.13	58541.13	55661.13	1.77:1
Lakhimpur	65635.97	65975.97	68515.97	70155.97	123513.50	53357.50	57877.50	54997.50	1.76:1
Sonitpur	65281.72	65631.72	68171.72	69696.72	124014.8	54318.04	58733.04	55843.04	1.78:1
NBPZ	65348.53	65693.53	68231.87	69755.20	123984.50	54229.27	58635.94	55752.61	1.78:1

**Table 3:** Regression co-efficient of various size groups of potato farmers of CBVZ of Assam

Particulars	Regression co-efficient			
	Group I	Group II	Group III	Pooled
Expenditure on labour (₹) $X_1$	0.11* (0.05)	0.05* (0.03)	-0.06 (0.04)	0.05 (0.03)
Expenditure on seed (₹) $X_2$	0.81 (0.08)	0.87 (0.06)	0.49*** (0.11)	-0.01 (0.02)
Expenditure on fertilizer (₹) $X_3$	0.09* (0.04)	0.01 (0.05)	0.86*** (0.20)	0.96 (0.03)
Expenditure on Machinery (₹) $X_4$	0.003 (0.04)	-0.005 (0.03)	-0.01 (0.06)	0.02 (0.03)
Expenditure Plant protection (₹) $X_5$	-0.005 (0.009)	0.001 (0.02)	0.11 (0.03)	0.005 (0.01)
R <sup>2</sup>	0.98	0.98	0.98	0.99

Figure in the parentheses indicate value of standard error

\*Significant at 10 per cent probability level

\*\* Significant at 5 per cent probability level

\*\*\*Significant at 1 per cent probability level

**Table 4:** Regression Co-efficient of various size groups of potato farmers of UBVZ of Assam

Particulars	Regression co-efficient			
	Group I	Group II	Group III	Pooled
Expenditure on labour (₹) $X_1$	0.01 (0.03)	0.25** (0.08)	-0.04 (0.05)	0.44 (0.07)
Expenditure on seed (₹) $X_2$	0.83 (0.09)	0.07 (0.07)	0.36** (0.09)	0.05** (0.03)
Expenditure on fertilizer (₹) $X_3$	0.15 (0.10)	1.56 (0.21)	1.58 (0.29)	0.68 (0.05)
Expenditure on Machinery (₹) $X_4$	0.11 (0.07)	0.04 (0.09)	-0.04 (0.09)	0.08** (0.04)
Expenditure Plant protection (₹) $X_5$	-0.005 (0.02)	0.15 (0.04)	-0.02 (0.04)	0.02 (0.01)
R <sup>2</sup>	0.96	0.97	0.98	0.99

Figure in the parentheses indicate value of standard error

\*Significant at 10 per cent probability level

\*\* Significant at 5 per cent probability level

\*\*\*Significant at 1 per cent probability level

**Table 5:** Regression co-efficient of various size groups of potato farmers of NBPZ of Assam

Particulars	Regression co-efficient			
	Group I	Group II	Group III	Pooled
Expenditure on labour (₹) $X_1$	0.51* (0.21)	0.63* (0.25)	0.75** (0.20)	0.08 (0.08)
Expenditure on seed (₹) $X_2$	0.19** (0.07)	0.14 (0.08)	0.17** (0.05)	0.26 (0.05)
Expenditure on fertilizer (₹) $X_3$	0.33** (0.10)	0.41** (0.12)	-0.005 (0.03)	0.19 (0.04)
Expenditure on land preparation (₹) $X_4$	0.35*** (0.08)	0.01 (0.11)	0.31* (0.12)	0.45 (0.06)
Expenditure Plant protection (₹) $X_5$	0.01 (0.02)	0.15* (0.07)	0.05* (0.02)	0.07** (0.02)
R <sup>2</sup>	0.97	0.94	0.97	0.99

Figure in the parentheses indicate value of standard error

\*Significant at 10 per cent probability level

\*\* Significant at 5 per cent probability level

\*\*\*Significant at 1 per cent probability level

Expenditure on fertilizer was not found significant for any of the size groups of farmers as most of the farmers were not found using recommended doses of fertilizer in potato farming in the zone. Similarly, the regression coefficient of expenditure on machinery was also not found significant for any of the size groups of farmers in the zone. This is because most of the farmers in the zone were found using traditional method of potato farming as commercial farming of potato was found less in the zone. The expenditure on plant protection measure was also not found significant for any of the size groups of farmers in UBVZ. The farmers were usually not following the plant protection measures in proper time to control the attack of pest and diseases in the crop as labour availability in the zone was not found abundant in the required time. Hence availability of required amount of labour and commercialization of potato farming was found needed to improve production in the zone.

Table 5 reflected that the coefficient of multiple determinations,  $R^2$  ranged from 0.94 in size group II to 0.97 in size group I and size group III farmers. It suggested that variable included in the function could explain 94 per cent to 97 per cent of total variation in production of potato crop in the study areas. It was observed that regression coefficients of expenditure on labour were found significant for all the size groups (0.51, 0.63 and 0.75) in the zone. This indicated that proper utilization of labour was found in all the size groups in potato farming to get better production. The expenditure on seed was found significant for size group I (0.19) and size group

III (0.17) farmers. This was not found significant in size group II farmers (0.14). Small farmers usually found selling all the stocks in one season as a result they need to incorporate fresh planting materials from the market which leads better production. Likewise large farmers were found using high yielding varieties with scientific planting methods in the zone which leads better production in the group. On the other hand size group II farmers were incorporated some percentage of potato from their own stock and some part from the market as a result the expenditure was not found significant for this group of farmers in the zone.

Figure 1 shows the ten years moving coefficient of variation of potato production in LBVZ of Assam starting from 1983 to 1993. It was reflected from the figure that after 1987 to 1997 sharp decrease in potato production up to the year 1993 to 2003 was observed in the zone. After 1994 to 2004 potato production moving in upward direction due to incorporation of latest technologies of agriculture in the farmers field. Launching of National Horticulture Mission had also some impact on upward movement of potato production in the zone.

Figure 2 shows the moving coefficient of variation of potato production in CBVZ of Assam. It was observed from the figure that potato production in the CBVZ of Assam was found more or less stationary during the whole period. The available sandy loam soil rich in organic matter content of CBVZ was the main cause of stationary production of potato throughout the period in the zone.

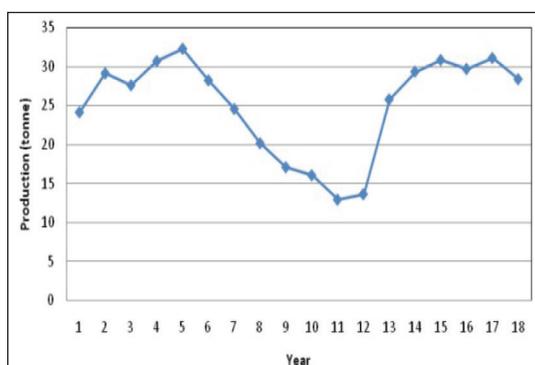


Fig. 1: Moving CV of Potato Production of LBVZ of Assam

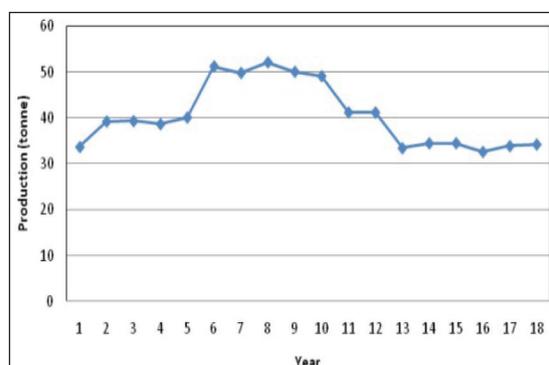


Fig. 2: Moving CV of Potato Production of CBVZ of Assam

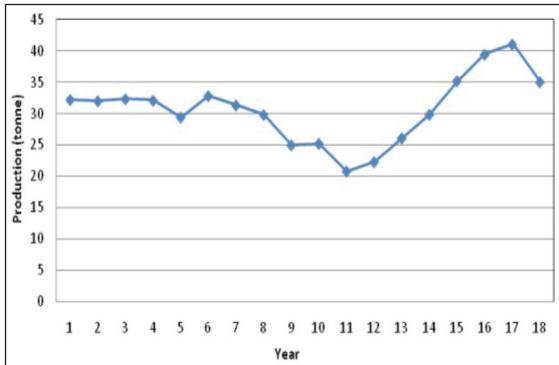


Fig. 3: Moving CV of Potato Production of UBZV of Assam

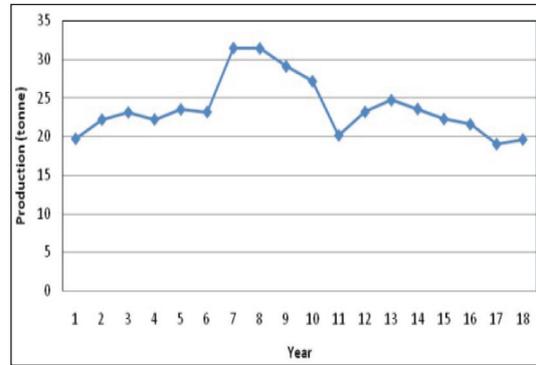


Fig. 4: Moving CV of Potato Production of NBPZ of Assam

Figure 3 shows the ten years moving coefficient of variation of potato production in UBZV of Assam from 1983-1993 to 2000-2010. It was reflected from the figure that up to 1993-2003 level of potato production was found to be stationary. After that it was showing upward movement of production in the zone due to incorporation of latest technologies of agriculture and launching of national horticulture mission in the state.

Figure 4 shows the moving coefficient of variation of potato production in NBPZ of Assam. It was reflected from the figure that the potato production in the zone was found more or less stationary. Suitable soil conditions and required amount of pre-sowing rainfall in the zone was found to be the main reasons of stationary production of potato over the years in the zone.

### CONCLUSION

The results obtained from the present study conducted with a view to analyzed the Production behaviour of potato in Assam across zones and size groups of farms reflected that per hectare potato cultivation cost was found to be highest for LBZV of Assam (₹ 70362.08) followed by CBZV (₹ 70357.07), UBZV (₹ 70238.78) and NBPZ (₹ 69755.20) respectively. In case of size groups of farmers it was reflected that potato cultivation cost increases with increase size groups of farmers. Gross income of the farmers were observed to be highest for LBZV (₹ 124032.20) followed by NBPZ (₹ 123984.50), UBZV (₹ 123726.70) and CBZV (₹ 123718.00) of Assam respectively. From findings of the study it was clearly observed that in all the zones of Brahmaputra Valley

with increase size groups of farmers area allocation under the crop increases as a result cost of production of potato was also increasing. With increase size groups and area allocation, the degree of commercialization of potato was also increases as a result the productivity of the crop was found increasing gradually from size group I farmers to size group III farmers. It was observed from the study that in LBZV the per farm resource productivity shows that variable included in the function could explain 96 per cent to 97 per cent of total variation in production of potato crop in the study areas. Similarly in CBZV variable included in the function could explain 98 per of total variation in production of potato. In UBZV variable included in the function could explain 96 per cent to 98 per cent and in NBPZ,  $R^2$  ranged from 0.94 in size group II to 0.97 in size group I and size group III farmers, respectively. The moving coefficient of variation of potato production in all the zones reflected that in LBZV of Assam, after 1987 to 1997 sharp decrease in potato production up to the year 1993 to 2003 was observed. After 1994 to 2004 potato production moving in upward direction due to incorporation of latest technologies of agriculture in the farmers field. Potato production in the CBZV of Assam was found more or less stationary during the whole period. In UBZV it was reflected that up to 1993-2003 potato production was found stationary. After that it was showing upward movement of production in the zone. Likewise in NBPZ it was observed that the potato production in the zone was found more or less stationary.

It was found that getting quality seed was the major problem in potato. Gogoi (2002) also found the same problem in Jorhat. Potato seed mainly comes from West Bengal which is not a conventional seed potato producing state. In Assam, the average size of the operational holding is only 1.37 ha (Bhattacharyya *et al.* 2001) and majority of the farmers are marginal and small. These farmers cannot afford to buy very expensive good quality seed. There is hardly any proper infrastructure for irrigation and the mighty Brahmaputra inundates the area almost every year. Hence, farmers use the mulching technique, which is one of the reasons for poor yield as no weeding operation and earthing up is done. Lack of scientific knowledge regarding potato production is also a reason for the low yield. Inadequate marketing infrastructure at the village level and poor transportation network are major marketing problems in the area (Bhattacharyya, 2001). In addition, it was found that 97 per cent of the produce is sold just after harvest due to lack of cold storage facilities in the area. Hence, lack of surplus money prevents the farmers from further investment in the potato crop. Considering the importance of potato in Indian agriculture and its ability to address the food security issue, following measures are required for sustainable potato production:

- ❖ Improving productivity through high quality seeds
- ❖ Development of advanced varieties with high yielding capacities and can sustain weather vagaries.
- ❖ Increasing the storage capacities through energy-efficient cold storage.
- ❖ Facilitating soft loans to small farmers and crop insurance at nominal cost.
- ❖ Improving the supply chain through proper monitoring at each stage.

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Borah *et al.*