Indian Journal of Extension Education
Vol. 56, No. 2 (April-June), 2020, (76-82)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Supply Chain of Potato in East Khasi Hills District of Meghalaya: A temporal Analysis

M. Rajavardhan[1], B. Sethi[2] and Ram Singh[3]*

ABSTRACT

Potato crop in the state has its own recognition and it is reaching to every ranch of the state. Keeping in view the present study was conducted in East Khasi hills district of the Meghalaya state. The findings demonstrates the growth trends of potato crop, producers' surplus, disposal pattern, price spread which are immense for developing the policy on production and post harvest management of the crop. As the channel-I was preferred and maximum produce was disposed; the channel-I need to be strengthened through technological intervention like value addition in the crop. Further, the price spread analysis is an insight for improvement in the market for unscrupulous practices adopted by different intermediaries in the potato market.

Keywords: Channel, Potato, Supply, Value addition

INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the prominent food crop in the world after rice and wheat in terms of human consumption (Gastelo *et al*., 2014). Direct consumption of potato as human food is 31.3 kg per capita per year (FAOSTAT, 2014). Potato is supplementing meat and milk products by decreasing energy intake and also by decreasing food cost. Potato plays multiple and prominent roles in neighbourhood food systems and for food security (FAO, 2008). By providing income generation opportunities as a cash crop and generating employment, potato contributes to alleviating poverty (Scott and Ringler, 2000). Further, it speak to a significant source of vitality, with a high conveyance of vitality per unit land, water and time, and are a prominent wellspring of mineral deposits and nutrients for the eating regimen (Anderson *et al*., 2010). The potato is a "cool climate crop", with the temperature being the primary constraining variable. The climate of the state of Meghalaya is highly congenial for cultivation of potato throughout the year. Potato occupies a key position in the cropping patterns in Meghalaya and significantly shares to rural agrarian economy. There are two potato crop seasons (Summer crop and Winter crop). "The average productivity of potato in the Meghalaya state produced 9.2 tons per hectare, almost half that of the national average" (CPRI, 2006). Factors like rainfed cultivation, non-availability of quality seed, high disease incidence, *etc.* contribute to low potato yields. The state has however high per capita potato utilization (93 kg) which is higher than even the national level potato consumption (17 kg).

In spite of having favorable climatic conditions including technological back-up for potato in the state; the state could not come-up in significant contribution of potato production in the country. There may be some hidden constraints with potato growers like mostly were illiterate with marginal and small landholding without any

[1]Agriculture Development Officer, Silchar, Govt. of Assam
[2,3]Professor, SSS, CPGS-AS, CAU (Imphal), Umiam-793103, Meghalaya
*Corresponding author email id: ramsingh.cau@gmail.com

of technologies, unorganized and scattered landholding and difficulty in marketing of potato in hilly terrains especially in remotely located villages. Hence, to enhance research and development expenditures in North Eastern Hill Region was especially to develop small size of machinery with the intent to reduce cost of human labour needed (Singh *et al.*, 2019). Other problems like; non-availability of finance, which led to distress sale of surpluses just after harvest at a low price (Singh *et al.*, 2020). Although, some extent contract farming model of main lands in India has protected the potato grower from its price uncertainty (Tripathi *et al.*, 2005). Marketing through Self-Help Group (SHG) may prove fruitful as a distribution strategy as women in the groups are having a high percentage of population and are willing to undertake entrepreneurial activities (Kumari *et al.*, 2019). Hence, temporal analysis of supply chain of potato in Meghalaya is immense.

METHODOLOGY

The present study was conducted in East Khasi Hills (EKH) district of Meghalaya as it contributes about 63.63 per cent of the total area and 68.90 per cent of the total production of potato in the state. Also the compound annual growth rate of area and production in this district has been observed to be increasing in proportionate way. Three markets namely regulated market (Mawiong), weekly market (Smit market) and daily market (Bara Bazar, Shillong) were selected as marketed surplus has been observed more of potato in these market of EKH district. A sample of 36 number of respondents, including trader, wholesaler, retailer and potato growers were interviewed for collecting primary data. Smit village was selected purposively because it was one of the highest potato producing villages in EKH district in both the seasons from where a sample of 10 potato grower was drawn. The primary data were collected for both the seasons from the same respondents of potato growers as well as the marketing agencies. The respondents were interviewed twice for *summer* and *winter* season as potato is grown in two seasons. Data were collected using pre-tested well structured schedule through personal interview of the respondents for the crop year 2019-20. The data collected from the respondents includes production, consumption and disposal of potato. Secondary data on production, area and productivity of potato has been collected for the period of 2005-06 to 2017-18.

Temporal analysis was applied to analyze the secondary data. Linear trend lines for area and production of potato were estimated. Compound annual growth rate (CAGR) was calculated by using log-linear model.

$$\text{Log } Y_x = \beta_1 + \beta_{2x} + u_x$$

Where, Y= dependent variable, x = time, $\beta 1$ = intercept, $\beta 2$ = slope coefficient, CAGR = (Exp ($\beta 2$)-1) X 100

Marketable surplus

$$M_s = P - C$$

Where, M_s = Marketable surplus, P =Total production, C=Total requirement (family consumption, farm needs, payment to labor, artisans, Land lord and payment for social and religious work)

Marketed surplus

$$M_t = M_s - (L_m - L_t)$$

Where, M_t = marketed surplus, M_s = marketable surplus, L_m = losses during transportation and marketing, L_t = arbitrary deduction or under weighing by traders at the market

The total cost incurred on marketing either in cash or in kind by the producer seller and by the various intermediaries involved in the sale and purchase of potato till the commodities reaches the ultimate consumer, was computed as:

$$C = C_F + C_{m1} + C_{m2} + C_{m3} + \ldots + C_{mi}$$

$$C = C_F + \Sigma C_{mi}$$

Where, C = Total cost of marketing of the potato, C_F = Cost paid by the producer at the time the produce leaves the farm till he sells it, C_{mi} = Cost incurred by the i^{th} middleman in the process of buying and selling potato.

Marketing margin of middlemen was the difference between the total payments (cost + purchase price) and

receipts (sale price) of the middlemen (i^{th} agency). It was expressed as:

$$A_{mi} = P_{ri} - (P_{pi} + C_{mi})$$

Where, A_{mi} = absolute marketing margin of i^{th} middlemen, P_{ri} = total value of receipts per unit (sale price), P_{pi} = purchased value per unit (purchased price), C_{mi} = cost incurred on marketing per unit

Percentage margin of middleman was worked out the percentage share of margin of middleman following formula has been used:

$$(P_{mi}) = P_{Ri-}(P_{pi} + C_{mi}) / P_{pi} x\ 100$$

Where, P_{Ri} = Total value of receipts per unit of produce (sale price), P_{pi} = Purchase value of goods per unit of produce (purchase price), C_{mi} = Cost incurred in marketing per unit.

Thus it includes the profit of the middleman and the returns.

Producer's Share in Consumer's price was calculated in terms of percentage of the retail price (*i.e.*, the price paid by the consumer) is the producer's share.

$$P_s = Pf / Pr\ X\ 100$$

Where, P_s = Producer's share in the consumer rupee, P_f = Price received by the farmer per unit of output, P_r = Retail price per unit of output

Price spread was referred as the difference between the price paid by consumer and the price received by the producer for an equivalent quantity of farm produce. It was calculated by using the following formula.

$$P_s = (P_s - P_f) / P_s\ X\ 100$$

Where, P_s = Producer's share in the consumer rupee, C_F = Price received by the farmer per unit of outputs, P_A = Retail price per unit of output, and

$$P_f = P_{A-} C_F$$

Where, P_f = Net price receive by producer, P_A = Wholesale price, C_F = Marketing cost incurred by producer

Hence,

$$\text{Price spread} = P_c - P_f$$

Where, P_c = price paid by consumer and P_f = price received by the producer

Marketing Efficiency was defined as the effectiveness or competence with which a market structure performs its designated function. This will be computed using the Acharya's modified marketing efficiency (MME) approach (Acharya and Agarwal, 2011) given as:

$$MME = FP \div (MC + MM)$$

Where, MME = modified measure of marketing efficiency, FP = price received by farmers, MC = marketing cost, MM = marketing margins.

RESULTS AND DISCUSSION

The analysis of growth trends were categorized into two periods *viz;* 2005-06 to 2012-13 and 2013-14 to 2017-18 as state of Meghalaya comprised 7 districts till 2012-13 and later on 4 more new districts were carved in the state to make the 11 district having state of Meghalaya.

The growth rate of area under potato was negative though not significant in the state in districts (Table 1). In the period of 2005-06 to 2012-13 South Garo hills recorded 4.60 per cent of growth in area. In Ri-bhoi district (0.32%) and East Khasi hills district (0.062%) showed positive growth but insignificantly. West Khasi hills (-0.58%) and East Garo hills (-4.88%) districts showed negative growth in the study period but non-significant. Table further reveals that annual growth rate of area was positive for all districts significantly at slow rate. The highest growth was of 10.16 per cent recorded in East Jaintia hills followed by Ri-bhoi district (8.09%). All districts showed significant positive growth in study period except East Garo hills district (1.25%) and North Garohills district (1.56%) where it was non-significant. Over all in Meghalaya area under potato increased significantly at a rate of 0.72 per annum during period of 2013-14 to 2017-18.

The growth of potato in terms of production was increasing across all the districts except Jaintia hills (-

Table 1: Growth rate of Area of potato in Meghalaya (2005-06 to 2012-13 and 2013-14 to 2017-18)

Particulars	Trend value	P-value	Equation	CAGR (%)
2005-06 to 2012-13				
Ri-Bhoi	0.0032	0.78^{NS}	3.29+0.003x	0.32
East Khasi hills	0.0006	0.7^{NS}	9.33+0.0006x	0.062
West Khasi hills	-0.006	0.13^{NS}	8.65-0.005x	-0.58
Jaintia hills	-0.05	0.05	5.61-0.05x	-4.88
East Garo hills	-0.0002	0.97^{NS}	4.89-0.0002x	-0.024
West Garo hills	0.032	0.05	6.08+0.032x	3.28
South Garo hills	0.045	0.01	3.81+0.04x	4.60
Meghalaya	-0.001	0.58^{NS}	9.79-0.001x	-0.106
2013-14 to 2017-18				
Ri-Bhoi	0.078	0.05	3.27+0.078x	8.09
East Khasi hills	0.005	0.05	9.36+0.005x	0.55
West Khasi hills	0.007	0.05	8.20+0.007x	0.70
South West Khasi hills	0.009	0.05	7.58+0.009x	0.93
East Jaintia hills	0.09	0.01	3.56+0.09x	10.16
West Jaintia hills	0.03	0.05	5.12+0.031x	3.15
East Garo hills	0.012	0.18^{NS}	4.34+0.012x	1.25
North Garo hills	0.015	0.22^{NS}	4.01+0.015x	1.56
West Garo hills	0.021	0.05	5.8+0.021x	2.09
South West Garo hills	0.005	0.01	5.41+0.005x	0.53
South Garo hills	0.03	0.05	4.13+0.027x	2.7
Meghalaya	0.007	0.05	9.81+0.007x	0.72

Note: NS-non significant

13.06%) and West Khasi hills districts (-2.10). Highest compound annual growth of production has been observed a rate of 3.76 per cent and 3.51 per cent in East Garo hills district and South Garo hills district, respectively. The production of potato in Ri-bhoi district and East Khasi hills district had risen non-significantly at the rate of 1.05 per cent and 0.42 per cent, respectively (Table 2).

The marketable surplus of potato in summer season and winter season was observed to be of 4465 kg and 3265 kg, respectively. Potato retained for different purposes like family consumption and seed material in which highest share was observed of seed material 16.93 per cent followed by family consumption (8.21%). Similarly, in winter season seed material recorded as highest share (15.33%) followed by family consumption (15.33%).

For the disposal of potato from the grower to the ultimate consumer three major marketing channels were identified as given below.

(i) Channel-I: Producer → Traders → Wholesaler → Retailer → Consumer

(ii) Channel-II: Producer → Wholesaler → Retailer → Consumer

(iii) Channel-III: Producer → Consumer

The highest quantity of the whole potato in summer season was observed to be disposed through traders which was highest followed by wholesalers, retailers and small portion straightly sold to the consumer (Table 4). Under channel-I (Producer → Traders → Wholesaler → Retailer → Consumer), the trader purchased 62.13

Table 2: Growth rate of production of potato in Meghalaya (2005-06 to 2012-13 and 2013-14 to 2017-18)

Particulars	Trend value	P-value	Equation	CAGR (%)
2005-06 to 2012-13				
Ri-Bhoi	0.01	0.25^{NS}	5.02+0.01x	1.05
East Khasi hills	0.042	0.26^{NS}	11.58+0.004x	0.42
West Khasi hills	-0.021	0.34^{NS}	10.92-0.0212x	-2.10
Jaintia hills	-0.14	0.05	7.79-0.14x	-13.06
East Garo hills	0.01	0.1	6.87+0.01x	1.05
West Garo hills	0.04	0.01	8.11+0.04x	3.76
South Garo hills	0.034	0.01	5.86+0.034x	3.51
Meghalaya	-0.004	0.5^{NS}	12.05-0.004x	-0.43
2013-14 to 2017-18				
Ri-Bhoi	0.085	0.05	5.07+0.085x	8.88
East Khasi hills	0.007	0.05	11.7+0.007x	0.73
West Khasi hills	0.008	0.01	10.19+0.008x	0.81
South West Khasi hills	0.009	0.05	10.13+0.91x	0.91
East Jaintia hills	0.10	0.10	5.29+0.10x	10.81
West Jaintia hills	0.032	0.05	6.72+0.03x	3.22
East Garo hills	0.008	0.38^{NS}	6.44+0.008x	0.77
North Garo hills	0.012	0.29^{NS}	6.12+0.012x	1.21
West Garo hills	0.157	0.16^{NS}	7.28+0.16x	16.9
South West Garo hills	0.009	0.05	7.62+0.009x	0.9
South Garo hills	0.022	0.05	6.13+0.02x	2.23
Meghalaya	0.008	0.05	12.1+0.008x	0.82

Note: NS-Non-significant

Table 3: Producer's surplus and utilization pattern of potato (kg)

Particulars	Summer potato	Winter potato	Overall
Total production	5965	3980	9945
a) Family consumption	490(8.21)	105(2.63)	595(5.98)
b) Seed material	1010(16.93)	610(15.33)	1620(16.29)
Total (a and b)	1500(25.14)	715(17.96)	2215(22.27)
Marketable surplus	4465(74.85)	3265(82.03)	7730(77.72)

Note: Figures in the parentheses are percentage to total production

percent of total volume of potato production directly from the potato producer and disposed-off to retail market. Under channel-II (producer → wholesaler → retailer → consumer), the retailer procured 45.2 per cent of potato production directly from the grower. The study also revealed that under channel-III (producer → consumer), the producer had sold 8.16 per cent of the total volume of their production directly to the consumer.

The study shown that net price received by potato producer was highest in channel-III (Rs 1794.17/q) which shared of 94.43 per cent of the consumer's rupee (Table 5). It was followed by channel-II and channel-I. It was evident that channel-III was most efficient due to less number of intermediaries followed by channel-II and channel-I. Further, higher marketing cost in channel-I (37.64%) was due to more intermediaries in the channel.

Table 4: Disposal pattern of potato through different channels (kg)

Marketing channel	Summer potato	Winter potato	Overall
Channel-I	3081.30 (69.01)	1803.91 (55.25)	4885.21 (62.13)
Channel-II	1158.22 (25.94)	1257.68 (38.52)	2415.9 (45.2)
Channel-III	225.48 (5.05)	203.41 (6.23)	428.89 (8.16)
Total	**4465 (100.00)**	**3265(100.00)**	**7730(100.00)**

Note: Figures in the parentheses are percentage to the total production

Table 5: Price spread of potato

	Channel -I	Channel II	Channel III
Summer			
Marketing cost	268.79 (12.89)	228.41 (11.42)	105.83 (5.57)
Marketing margin	516.21 (24.75)	455.81 (22.79)	-
Price spread	785 (37.64)	684.22 (34.21)	105.83 (5.57)
Net price received by producer	1300 (62.35)	1316.78 (65.84)	1794.17 (94.43)
Consumer price	2085	2000	1900
Winter			
Marketing cost	272.52 (10.09)	236.07 (9.15)	107.89 (4.50)
Marketing margin	677.48 (25.09)	523.45 (20.2)	-
Price spread	950 (35.18)	759.52 (29.44)	107.89 (4.50)
Net price received by producer	1750 (64.81)	1814.40 (70.32)	2292.11 (95.50)
Consumer price	2700	2580	2300

Note: Figures in the parentheses are percentage of the consumer's price

The consumer's price was quoted highest in channel-I (Rs 2085/q), followed by channel-II (Rs 2000/q) and channel-III (Rs 1900/q). The study exposed that net price received by potato grower was recorded to be highest in channel-III (Rs 2292.11/q). It was evident from the study that channel-III was most efficient in which marketing cost. Consequently, potato producer received higher share in consumer's price under channel-III (95.50%). It may be due to non-existence of marketing functionaries in the channel. The consumer's price was recorded highest in channel-I (Rs 2700/q), followed by channel-II (Rs 2580/q) and channel-III (Rs 2300/q).

CONCLUSION

The growth rates of area and production of potato were in increasing trend in recent period but it was found declining in earlier period *i.e.* 2005-06 to 2012-13. The marketable surplus also found in safer side and signifies healthy and sound economic status of the potato growers in the state. The channel-I was found to be preferred channel through which highest produce was disposed to the market. Hence, the channel-I must be taken care to enhance its efficiency through market intervention for increasing the due share of the potato growers in consumer' price. Further, looking the marketable surplus of the potato in the state some interventions related to value addition must be tapped in the state.

Paper received on : April 07, 2020
Accepted on : April 22, 2020

REFERENCES

Acharya, S.S. and Agarwal, N.L. (2011). Agriculture marketing in India (fifth edition), Oxford and IBH publishing Co. Pvt. Ltd., New Delhi, pp 448-461.

Anderson, P., Barker, I., Best, S., Bonierbale, M., Crissman, C., Hareau, G. and Velarde, C.L. (2010). Importance of roots and tubers in the world food system; Digging up the evidence. Unpublished working document, Lima, Peru.

CPRI (2006). CPRI vision, Central potato research institute, Shimla, pp 35.

FAO (2008). New Light on a Hidden Treasure. Edited by Food and Agriculture Organization of the United Nations. Rome (Italy).

FAOSTAT (2014). FAOSTAT Database. Food and Agriculture Organization of the United Nations, Rome (Italy).

Gastelo, M., Diaz, L., Landeo, J. and Bonierbale, M. (2013). New elite potato clones with heat tolerance, late blight and virus resistance to address climate change. In: Low, J., Nyongesa, M., Qunin, S. and Parker, M. (eds) Transforming potato & sweet potato value chains for food and nutrition security, Oxfordshire, United Kingdom, CABI International, pp.143-152.

Kumari, N., Malik, J.S. and Ghalawat, S. (2019). Training and marketing channel as determinant of empowerment of rural self help group women members, *Indian Journal of Extension Education,* **55**(1), 37-42.

Scott, G., Rosegrant, M. and Ringler, C. (2000). Roots and Tubers for the 21st Century - Trends, Projections, and Policy Options. Washington D.C. and Lima.

Singh, R., Chahal, V.P., Feroze, S.M. and Kumar, S. (2020). Impact of factors share on productivity of ginger (*Zingiber officinale*) in NEHR of India, *Indian Journal of Agricultural Sciences,* **90**(2), 279–282.

Singh, R., Singh, M.P., Singh, R.K. and Chauhan, J.K. (2019). A study on mobile based agro-advisory in Meghalaya, *Indian Journal of Extension Education,* **55**(1), 71-77.

Tripathi, R.S., Singh, R. and Singh, S. (2005). Contract farming in potato production: An alternative for managing risk and uncertainty, *Agriculture Economic, Research Review,* **17**(1), 47-60.