

ROLE OF SEED ON FUTURE POTATO PRODUCTION IN GUJARAT

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Gujarat holds first position in potato productivity having 30.64 tons/ha as compared to national average of 23.67 tons/ha in 2019-2020 (Panigrahy and Kalamkar, 2021). The Western region of India contributes 14.47 percent to national potato production, in which Gujarat accounts for 51.27 percent (GOI, 2017). Starting from infrastructural development (cold storage, logistics) to setting up many processing organizations, this state represents itself as a model in national spheres that pave a way towards potato business ecosystem. Despite all the rosy pictures and facts in favour of potato production of the state, cost of production has been increasing which is a matter of concern for many. It was observed that seed impacted maximum in cost of potato production (Pandey *et al.*, 2018) and Gujarat has the natural disadvantages being not fit to produce seeds due to its warmer climatic condition (Rana *et al.*, 2012). As a result, producers depend on other states for quality seed that escalates the cost of potato production. Seed is biological in origin and thus requires a specific temperature and humidity to be kept in cold storage. Many times, potatoes are used as seeds during subsequent year cultivation and even, some spurious seeds are also used by producers due to lack of

availability and dependency on the other states. Another concern in potato production is that yield was almost stagnant in spite of increase in area and production (Pandit and Chandran 2011; Rana and Anwar, 2018). Here, it becomes necessary to strengthen technological dimensions through better quality seed production in coming future for potato production. In different research, it has been observed that variable cost in potato production is significantly higher than fixed cost (Singh *et al.*, 2019; Sinha and Singh, 2019) and among the variables cost, seed cost shares maximum (Chaudhari *et al.*, 2017). It was also observed that in potato contract farming, seed cost had a vital share in overall input cost. It may be one of the reasons; many processing organizations are connecting with potato producers by supplying quality seeds at affordable rate with better accessibility. However, sometimes those seeds are shared and used by other noncontract producers. This situation brings legal impositions under plant varieties and farmers rights act 2001 as observed in Sabarkantha districts of Gujarat in 2019 where PepsiCo sued a case against four potato noncontract farmers for using its seeds without its knowledge and consent.

With this backdrop, seed has been found as a critical input in potato production

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and in state like Gujarat, its importance is highly significant among the producers due to unavailability and high cost of seeds. To understand about role of seed on potato business environment, three major objectives were tried to establish through this study;

1. Area, production and productivity of potato in Gujarat
2. Impact of potato seed on cost of cultivation in noncontract and contract farming
3. Analysis of potato seed rate in two different production system

The study was conducted in the state of Gujarat in 2019-2020. For accomplishing different objectives in this study, both primary, as well as secondary data were collected. The secondary data were compiled from the published reports and websites (Horticultural Statistics at a Glance, NHRDF, Office of the Director of Agriculture, Govt. of Gujarat, Gandhinagar etc). Primary level data were collected through pre-structured and tested schedules from selected potato farmers. Multistage random sampling technique was used for the selection of sample potato farmer households in Gujarat. Northern Gujarat and more specifically, Banaskantha, Arvali and Sabarkantha districts were selected here as these districts accounted 79 per cent of the total area under potato cultivation in Gujarat. After that a total of 10 talukas were selected from selected three districts, i.e. two talukas from Banaskantha district, five talukas from Sabarkantha district, and three talukas from Aravalli District. From ten selected tehsils, total thirty villages were identified according to their area covered under potato production after discussion with the taluka horticulture officer and elite farmers of the corresponding talukas.

As per the proportion of potato farmers in selected villages, a total of 1000 potato growers were selected randomly from selected villages to make a total sample of

1000 potato growers which comprised 180 farmers exclusively producing processing varieties of potato and 820 potato farmers exclusively producing table varieties. It was observed that processing varieties of potatoes are exclusively cultivated under contract system while table potatoes are cultivated in the regular mode by the farmers during survey agriculture year 2019-20.

The growth rate of APY (Area Production Statistics) of potatoes in Gujarat was worked out through the following formula

$$Y = ab^t e_t$$

Where Y = Dependent variable for which growth rate has been estimated

a = intercept

b = regression coefficient

t = time variable

e = error term

The linear form of the equation has been obtained after doing a logarithmic relationship among the variables

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

The compound growth rate (r) was computed by using the relationship

Where

$$R = [\text{Antilog } \log_e (b-1)] \times 100$$

The cost of cultivation of potatoes was calculated by using CACP (Commission for Agricultural Costs and Prices) method.

After that, all the input costs were categorized into variable cost and Fixed cost.

Variable Cost	Fixed Cost
• Cost of potato seed	• Cost of depreciation
• Cost of fertilizer	• Cost of Interest on Working Capital
• Cost of Farmyard Manure	• Cost of Rental Value
• Cost of Irrigation Power	• Cost of Overhead
• Cost of Weedicides	• Cost of Management
• Cost of Plant Protection Chemicals	
• Cost of Hired Labour	
• Cost of Family Labour	
• Cost of Machine Labour	
• Cost of Mechanization	

Potato production and subsequent consumption throughout India got momentum after the Liberalization, Privatization and Globalization (LPG) period. Its impact was also observed in all the states more particularly in Gujarat. Looking into the importance of production and area under potatoes after the LPG era, twenty-four years of data (from 1997-98 to 2019-20) were considered for the trend analysis purpose. It can be seen from Table 1 that during the period from 1997-98 to 2019-20, production of potato has increased by 436 per cent over the base year which was mainly due to 327 per cent increase in area under potato crop during the corresponding period. The productivity level of potato has increased by 25.5 per cent only. The highest rate of growth in potato production of 10.57 per cent was estimated during the period from 2000-01 to 2009-10. During the last decade also, production has increased at the rate of almost 9 per cent per annum mainly due to almost 7.5 per cent

Table 1 Growth in Area, Production, and Productivity of Potato in Gujarat (1997-98 to 2019-20)

Particulars		Area (‘000 ha)	Production (in ‘000 MT)	Yield (Ton/ha)
TE 1997-98		29.37	692.07	23.62
TE 2002-03		33.63	766.03	22.82
TE 2012-13		75.76	2259.02	29.75
TE 2019-20		125.31	3709.82	29.65
Growth				
1996-97 to 1999-00	CAGR (%)	2.97	-2.98	-5.92
	Sig.	0.44	0.48	0.15
2000-01 to 2009-10	CAGR (%)	8.54	10.57	2.04
	Sig.	0.00	0.00	0.04
2010-11 to 2019-20	CAGR (%)	7.58	7.74	0.16
	Sig.	0.00	0.00	0.68
1996-97 to 2019-20	CAGR (%)	7.45	8.97	1.53
	Sig.	0.00	0.00	0.00

*Note: Growth rate per cent per annum.

*Source: Office of the Director of Agriculture, Govt. of Gujarat, Gandhinagar

per annum increase in area under potato during the said period. In the same period, yield was insignificant (sig value >0.5). Some of the steps like technological breakthrough in seed sector, infrastructural development, effective natural resource management and good agricultural practices may improve the yield of potato from the farmer's field in India.

The cost of cultivation is an important indicator of the inputs invested during production practices. It can be seen from comparative analysis of two production system (table 2) that cost of cultivation per

Table 2 comparative cost of cultivation of potatoes in two production system

Input Particulars	Non Contract Potato Farming (table varieties potatoes)		Contract Potato Farming (processing varieties potatoes)	
	(n=820) Overall		Overall (n=180)	
	Value (Rs)	%	Value	%
Seed	74691.3	53	96119.7	62.6
Fertilizer	23289.5	16.5	20216.7	13.2
FYM	6253	4.4	3295	2.2
Irrigation	1859.1	1.3	1105	0.7
Weedicide	1691.1	1.2	1583	1.0
Plant Protection Chemical	598.9	0.4	647.7	0.4
Hired Labour	1633.4	1.2	855.2	0.6
Family Labour	1637.1	1.2	911.9	0.6
Machine Labour	212.6	0.2	225.3	0.2
Mechanization	2190.9	1.6	2325.5	1.5
Total variable cost	114056.9	81	127285.1	82.9
Depreciation	109.5	0.1	115.3	0.1
Interest	1967.8	1.4	7.6	0.0
Rental	10629	7.6	11607.8	7.6
Overhead	1299.2	0.9	822.7	0.5
Management	12808	9.1	13646.5	8.9
Total Fixed Cost	26813.4	19	26199.9	17.1
Total Cost	140870.3	100	153485	100

*Source: Estimated using field survey data

hectare was estimated to be around Rs. 1, 40,870/- for table varieties of potatoes and Rs. 1,53,485/- for the processing one. It was observed that table varieties potato seeds shared 53 percent in overall cost of cultivation whereas processing varieties potato seed accounted 62.60 percent in its respective cost of cultivation. It was also inferred from the same table that total cost of cultivation per hectare for processing varieties of potatoes were 8.95 percent higher than the table varieties of potatoes. Similarly, cost of processing varieties seeds were 28.68 percent higher than cost of table varieties seeds in per hectare basis.

Seed is a major input that accounts significant share in the cost of cultivation of potatoes. The table variety potato growers had procured the seed tubers mostly from the Jalandhar market in Punjab state while few of

them had procured from some dealers in the local market while some of them have used their own. In the case of processing variety seed, seed was provided by the contracting firm. The seed rate estimated for processing varieties was found to be higher (35.35 qtls per hectare) than table varieties of potato (30.57 qtls/ha) (Table 3 and 4). The average market rate of seed used for table varieties of potatoes was estimated to be Rs. 1055/- per quintal while the same was estimated higher for processing varieties of potatoes which was provided by the contracting firm (Rs. 1372/- per quintal). For table varieties potatoes, the seed rate for the Pukhraj variety was lesser than Badshah variety due to the high moisture content in it.

Informal contract is very much flexible for both producers and processors. It helps to reduce the transaction cost of the processors

Table 3 Details on Use of Potato Seed of Table Varieties

Source of Procurement	Average qtl seed used per ha	Price of seed per 50kg	% Bifurcation	No. of Potato Producers	Price of Potatoes for 20 kg
Jalandhar Market (By Producer)	36.50	1100-1200	55	451	120-170
Jalandhar Market and Private Organization (By Cold Storage Manager)	31.14	1100-1200	15	123	120-170
Private Organizations through their dealers (Marino, Siddhibinayak, Kalindi, ITC)	29.38	1100-1200	10	82	120-170
Own Seed	25.26	900-950	20	164	120-170
Total	30.57	1055	100	820	149.78

*Source: Field survey data.

Table 4 Details on Use of Potato Seed of Processed Varieties

Source of Procurement	Average qtl seed used per ha	Price of seed per 50kg	% Bifurcation	Potato Producer	Price of Potatoes for 20Kg
Through Formal Contract	35.20	1300-1450	16.67	30	182-190
Through Informal Contract (Local Language only in the contract)	35.13	1300-1450	18.52	33	180-190
Through Informal Contract (verbal contract)	35.42	1300-1450	47.69	85	200-240
Through Informal Contract (Price is written only in the contract)	35.68	1300-1450	17.13	32	180-190
Total	35.35	1372.00	100.00	180	186.80

*Source: Field survey data.

and generates ease of doing business for both the stakeholders. Wherever, seed price of processing potatoes were almost similar irrespective of contract or noncontract potato farming. It was observed during the field survey that the cost of seed for Santana variety was a little bit higher as demand for French fries has been increasing day by day. It has been observed from the above tables that the cost of seed of processing varieties was 30 percent higher than table varieties of potatoes. The sale price of the produce of these varieties per 20kg was also 24.71 percent higher than its counterpart. Though the seed cost of processing varieties was higher than the table varieties yet the better sale price of processing varieties added extra advantages in market. The cost of seed getting from the Jalandhar market was estimated to be higher which may be due to the number of traders pushing the seed at the Deesa market in the month of November. Due to poor availability, farmers/producers have been using the local market seed. Again, it was perceived that the seed of the Jalandhar market was comparatively better in quality as compared to other seeds, but it is costlier as well.

Growing seed cost is the matter of concern for potato producers in Gujarat that can be handled by increasing the accessibility of quality seed at producers door step. The coordination and cooperation of state agricultural universities, extension departments, and Krishi Vigyan Kendras (KVKs) assist the potato producers in getting the pertinent support and subsidies. State government may provide a platform of total stock and total supply in category wise by which potato producers can plan proper management of resources for utilization. Successful marketing channels (buyback arrangement of Banas Dairy & Hyfun Company) may be replicated for other

producers and processors for reaping its benefit from potato farming in Gujarat.

CONFLICTS OF INTEREST

The authors confirm that this manuscript has no conflicts of interest

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