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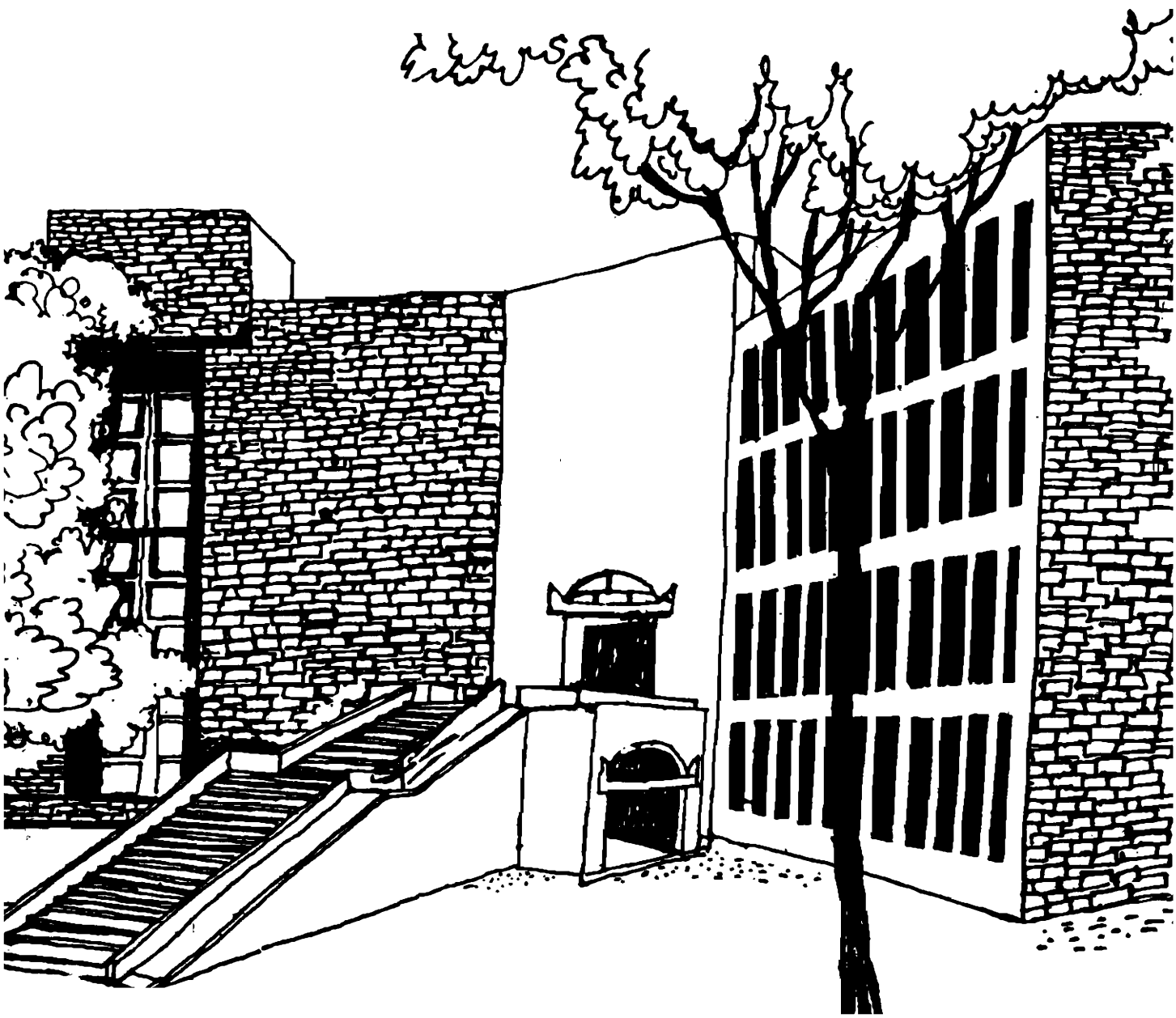

SLOW PACE OF MODERNIZATION IN FRESH PRODUCE POSTHARVEST SYSTEMS IN AHMEDABAD REGION

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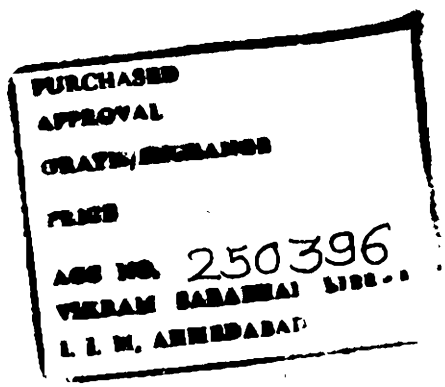

Slow Pace of Modernization in Fresh Produce Postharvest Systems in Ahmedabad Region

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Abstract

In this paper we present a profile of the post harvest system prevailing in Ahmedabad region. Normally the path followed by fresh produce is: farm-APMC market-sub-wholesalers-retailers-consumers. Observations relate to each segment with tomato dealt with more closely. It is argued that considerable detailed engineering work is needed to modernize the system.

Fresh Produce Postharvest System

Wholesale trade of fruits and vegetables in cities and towns is organized and supervised by the Agriculture Produce Market Committees (APMC). In Ahmedabad, APMC markets oversee arrival of some 0.5 million tons of F&V annually, or on an average about 1400 tons daily. Most of it is vegetables. This works out to approximately 1.3 kg per day per household. Arrivals are distributed in the city and also in satellite towns. So the consumption level in Ahmedabad will be slightly less, perhaps one kg per day per household. Growth in arrivals is driven by population and also rises in the incomes.

Altogether some 50 items are brought to the APMC market each day. The main constituents are three - potato (28%), onion (20%) and tomato (8%). Remainder consists of greens and fresh vegetables whose mix changes from season to season [1]. Potato, onion and tomato are brought from several different areas in the country, when it is not harvest time within the state. The greens, however, generally come from growers within the state, some 100-150 km around the city. Local produce could be in transit for two to four hours before arriving at APMC; that from out of state - say Punjab, Karnataka - much longer, 30 to 60 hours. Sellers can enter the market round-the-clock. But most do so early evening and through the night. Produce is held-over in APMC until auction in the early part of next day. There is no environmental control in the shops and the spaces at APMC. Time elapsed from harvest to auction would be some 20 hours for local produce, 70 to 80 hours for that from out of state.

Produce from outside the state generally comes in 7 ton trucks, that from growing areas within the state in 3-ton trucks. These vehicles have spring - dashpot suspension. Growers in close proximity of the city (say upto about 50 km) also use `Chhakadas', a motorized small three-wheeled van holding about 300 kg of payload. The chassis is sprung but has no dampeners. A simple tarpaulin or HDPE sheet is used as covering on top of the carriers. Usual stacking height in trucks is 1.5 meter. Vehicles traverse rural roads, stretches of state and national highways in the course of journey. No data exists on Road Roughness Index (RRI) of rural roads, but numerous discontinuities with potential for

mechanical damage can easily be seen. It is corroborated by the battered state of produce when it arrives. The packaging used by growers is unable to protect and produce sufficiently. Gunny bags, large cotton sheets, recycled cardboard cartons are used for packaging (**Table-1**). Some produce also comes in bulk form.

In the first half of the day, APMC market is very crowded with 2000 to 3000 vehicles of various size and type visiting there. When built in 1980 the main APMC market at Jamalpur was handling 700 tons per day which worked out to 6 m^2 of floor space per ton of produce handled. Increased arrivals has now reduced it to 3 m^2 per ton. Congestion and litter contribute to the possibilities of mechanical injury and contamination **[2]**. APMC markets are generally rich in resources. Their record keeping system is manual but systematic and comprehensive. Origin of produce, quantity and prices that ruled are recorded and published daily.

Buyers (sub-wholesalers and retailers) come to APMC in morning hours. Their vehicles are smaller and more varied - hand carts, motorized carts, camel carts, small trucks, cycle rickshaws and head loads. It could take one to two hours to reach the stores. Vendors in Ahmedabad are of three types--the regular shops, hawkers with a handcart, hawkers with head loads. Daily turnover of regular shops varies from 200 kg to 500 kg. There could be 2000 to 3000 vendors in the city.

In regular shops, vendors can be seen unpacking the produce in the early hours, washing and cleaning some of it. Produce is displayed in shallow bamboo trays stacked on a pyramidal wooden rack. Vendors equipment includes a large tub used to wash some of the produce, balance and weights, plastic carry bags (now banned), and plastic trays. In hot weather, produce is covered with wet sacking during noon hours and sprinkled with water once or twice a day. Most shops are open kiosks without any environmental control, in fact even without regular provision of electricity and water.

Consumer in Ahmedabad usually buys vegetables twice a week. Most purchases are made in morning hours and then again in early evening. Typically, customer's crowd around the front of the shop asks for the prices, make bargains; place their order for one item at a time. The vendor reaches out and picks the items from the rack, weighs the produce and puts it in carry bags. Customers pay and leave. Customers often also have to pick and choose from the baskets to ensure that damaged pieces do not get into their lot. Produce remains in the shops for upto 12 hours. Including this time, the time elapsed between harvest and purchase by consumer could be about 30 hours for local produce and 80 to 90 hours for that from out of state. In short, the produce often becomes stale and shopping is neither convenient nor very pleasant experience. In what follows we shall take a closer look at tomato postharvest system.

Tomato Around Ahmedabad Region

Nearly fifty villages on Sanand-Kadi Road grow commercial scale tomato. Average annual production is about 100,000 tons. Produce begins to arrive in November and continues through March. Cultivars like Pusa Ruby, Rupali, Vaishali, Rashmi, Shivaji, Avinash-2 and Namdhari are common **[3]**.

Harvesting

Fields are harvested over four to five rounds, at four-day interval. Pickers move along the rows with a *Dabba* - tin box with a wire suspender - which can accommodate 3 to 4 kg or they may use a bamboo basket (*vaas na topla*) of around 8 to 10 kg capacity. When full, these are emptied into larger bamboo baskets placed at the head of the rows. Later, the baskets are taken to a shed and put into a heap for sorting and packing.

Sorting and Packing

Sorting shed is a makeshift enclosure made of corn or sorghum stower. Sorting is done by hand in which 2-3 labourers, usually women, are involved. No real grading is done. Poorly developed fruits, those with insect and field injuries are sorted out. Rest of the produce is packed, mostly in wood carton (peti) of 20-kg capacity. If wood cartons are not available or the prices are high growers use recycled CFB cartons. These once carried consumer goods like T.V., compressor, biscuits, beer, and cosmetics etc. Carton is lined with a layer of newspaper, which is also put on top to cover. Cartons are tied up by nylon or jute twine (*suthli)*. By prior arrangement, trucks collect the cartons from farm gate by late afternoon for transport to Ahmedabad. Cartons are unloaded and stay in the market until sold in the first half of the next day. The three-ton trucks and `Chhakadas' are used in transport. We have now developed CFB cartons specifically for tomato, taking into account its mechanical and physiological properties **[4, 5, 6].**

Temperature Regime

Most parts of Gujarat including Ahmedabad have dry weather with temperatures upwards of 30 ^{0}C (**Figure-1**).

Quality on Arrival at APMC

Quality inspection of tomato arriving at APMC, Ahmedabad, revealed that the proportion of fruit without any visible damage or defect (these could have internal or latent damage) was only about 40% [7]. The remaining tomato had varying degree of bruise, cuts, growth cracks, insect and other injuries. About 17 per cent were entirely unserviceable. This was the case for tomato that had traveled over 250 km. **Figure-2** shows the weight distribution of fruits. Large variation is expected in view of the fact that no real grading is done at farm. We shall see presently that vendors do some more careful sorting at the shop.

Quality and Price at Vendors

Table-2 shows the price of the same variety of tomato at four different shops on the same evening. Shops # 1 and 2 are located in higher income areas sold larger size tomato, better in appearance with less of visible damage. These realized a higher price. Shop # 3 is in middle income area and # 4 in lower income area. There is evidence that consumers are willing to pay for better quality.

the crated produce to a sequence of drops. Shops and spaces at APMC have no environmental control. Same is the case with vehicles and retail shops. Produce is also exposed to sources of contamination. Observations on tomatoes at APMC revealed large amount of just the visible mechanical damage. Only one third of the tomatoes were free from visible damage. Climate in Ahmedabad region is generally dry with ambient temperatures upwards of 30 ^{0}C.

There are no prescribed standards for fresh produce in domestic market, excepting some fruits. Postharvest system can be said to be `produce oriented' not consumer oriented. It stands in need of improvement in all aspects - packaging, transport, storage, washing, cleaning, grading, sorting and retail unit design.

There are two positive trends observable. Large growers and other businessmen are beginning to develop their own supply chains and retail stores. Secondly, produce from overseas has begun to be available in Ahmedabad. This will spur the local entrepreneurs to speed-up modernization. Lack of experience in handling perishables, non-availability of equipment systems for small scale integrated operations are some of the constraining factors. Large amount of work has been done in the country in developing equipment for specific unit operations **[9]**. Integrated systems need more attention.

Acknowledgement

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Problems Associated with Present System

Present post-harvest system can be said to be produce (not consumer) oriented **[8]**. Consumers have to buy whatever is sent to the market in whatever form and state. Produce incurs heavy mechanical damage and spoilage. The technology employed in packaging, transport, storage, and handling has not changed. There is no provision for environmental protection either in transit or at nodal points enroute. The retail stores also do not have provision for environmental protection and control. Numerous sources of contamination are present in the post-harvest phase.

Producers get low revenue. Tomato growers of Sanand, for instance, get only one-third of the consumer rupee. Although the major part goes to the market channels, this has not led to improvement in the techniques of handling and transport. Nor do they undertake activities like grading, packing, washing, cleaning which can add value.

Emerging Trends in Fresh Produce Retailing

There are some changes observable in the post-harvest system of fruit and vegetable in Ahmedabad. Vendors are buying regular and bigger commercial space to set up shops instead of continuing from irregular kiosks. Some vendors have added fruits to their line of business. We have come across some others who also wish to add cut flowers. Many large growers around Ahmedabad are considering direct retailing (instead of sending produce to APMC) either through jointly owned shops of their own or supplying to existing vendors on regular basis. There are also businessmen who are setting-up exclusive fruit and vegetable stores sourcing supplies from contractual growers. Old weigh scales are still the most common, but many vendors have acquired electronic balances and hand calculators.

Another new and positive development is that fresh produce (apple, kiwi, mango) from overseas has begun to be available in some of the shops in the city. These are coming from Australia, Iran, Thailand, and New Zealand. This will spur improvement in local system.

Lack of experience in handling perishables, difficulty of managing supplies from villages etc are however factors that deters entry. While several large modern departmental retail stores have come up in the city, these have not added fruit and vegetable section. We have also come across some growers who tried direct retailing at a small scale but had to abandon the effort after one or two seasons. A plausible reason for this could be that operating at small scale they could not influence prices and were disappointed that vendors did not give premium for the quality

Recapitulation

Nearly 1400 tons of fresh produce (vegetables and fruits) is brought to APMC market an average each day. Produce coming from within the state would have traveled for 150-200 kms, that from out of state up to 1500 km. Time elapsed from harvest to auction at APMC for local produce could be some 20 hrs, that from outside 70 to 80 hrs. Rural roads have high Road Roughness Index. Handling at APMC is manual subjecting

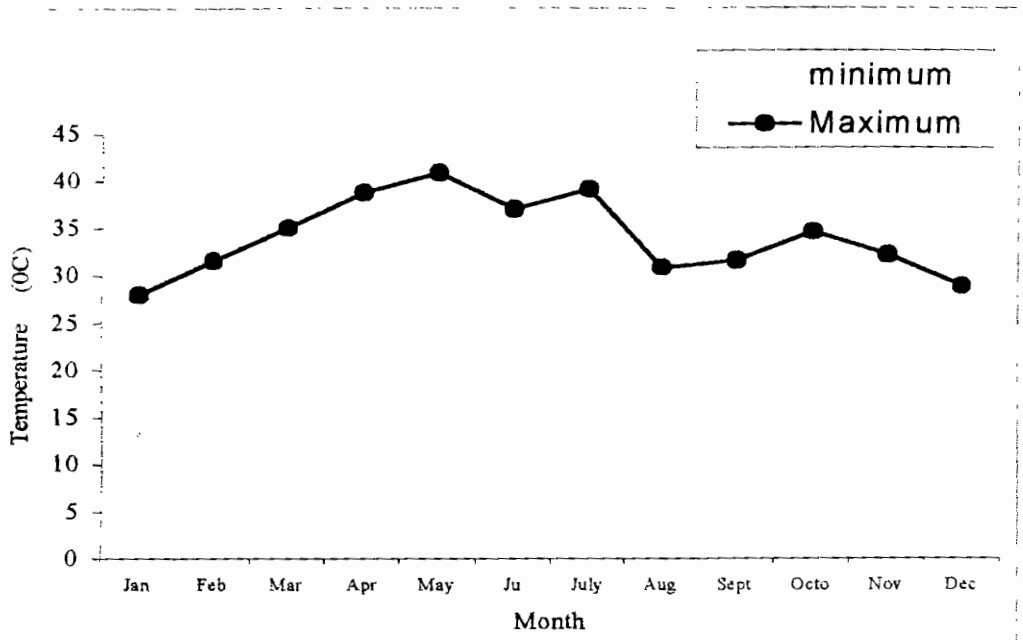

Figure-1 Air temperature in Ahmedabad

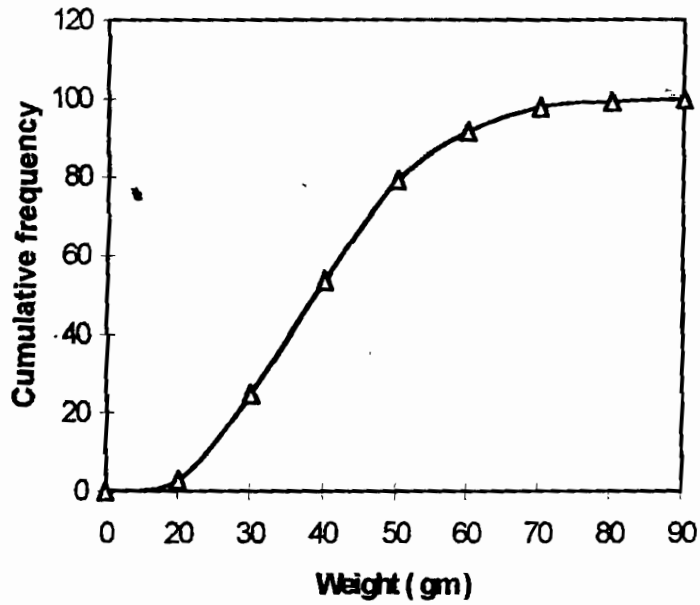

Figure-2 Frequency Distribution of Weight of Tomato From a Typical Crate

Table-1 : Fruits and Vegetables in Ahmedabad Region

Items	Production Area	Harvesting			Sorting	Grading	Washing	Packing
		Season	Interval	Equipment				
Cabbage	Sabarkantha, Sadra, Amreli, Pratij, Vadvasa, Parbatpura	Nov-Dec Aug-Sept Oct-Feb	Daily	Sickle / Sharp knife	✓	X	X	Gunny bag
Cauli - Flower	Sabarkantha, Pratij, Vadvasa, Parbatpura, Kathawada, Kelivasna, Dahod, Bharuch, Mehemdabad	Oct-April Oct-Feb Sept-Dec	Daily	Sickle / Large sharp knife	✓	X	X	Gunny bag
Brinjal	Limbadia, Dilwada, Amaja, Unawa, Amali, Sarkej, Kuha, Raisan	July- Jan Octo-Feb	2-3 days	Manual / knife	✓	✓	✓	Gunny bag, reused carton
Green Chilli	Unawa, Umja, Mubarkpur, Pinjada, Vasan, Edar, Uad Veraval, Mahesana, Chitapar,	Nov-April Octo-March	7 -10 days	Manual	✓	X	X	Gunny bag
Cluster bean	Surat, Vanch, Dabhoda, Dhanchura, Bayad, Bolad, Rajkot	May- July	7 -10 days	Manual	✓	X	X	Gunny bag
Cow pea	Surat, Vanch, Dabhoda, Dhanchura, Bayad, Bolad, Rajkot	May- July	2 - 3 days	Manual	✓	X	X	Gunny bag
Pea	Meerat, Mahuva, Belhi	Octo-April	7 -10 days	Manual	X	X	X	Gunny bag
Spinach	Dholka, Kheda, Asodar, Vasada, Sabarmati river	Nov- Feb	1 - 3 days	Sickle / sharp knife	✓	X	X	Dry Cloth
Fenugreek	Dholka, Kheda, Asodar, Vasada, Sabarmati river, Nadiyad, Nahenpur	Nov- Feb	3 -4 days	Manual	✓	X	✓	Gunny bag / Dry Cloth
Coriander	Rajkot, Nadiyad, Kheda	Through out the year	15 - 20 days	Manual / Sickle	X	X	✓	Gunny bag / Dry Cloth
Okra	Dilwada, Rampura, Rajkot, Shahapur, Ider, Himmatnagar, Loharpur, Siholi, Padiyad	Through out the year Feb - April	2 -3 days	Manual	✓	✓	X	Gunny bag

Table-1 Contd.

Items	Production Area	Harvesting			Sorting	Grading	Washing	Packing
		Season	Interval	Equipment				
Mango	Andhra Pradesh, Maharashtra, Valsad, Junagadh	April-June		Bedi	✓	✓		bulk, gunny bag, wood crate, CFB
Sapota	South Gujrat			manual				Gunny
Apple	J & K, Himachal Pradesh							CFB
Grape	Maharashtra							CFB
Pomogranate	Nashik							CFB
Pineapple	Keral, Assam							Bulk
Orange	Maharashtra							Wood crate
Sweet lime	Aurangabad							Gunny

Table-2

Size Colour and Price of Tomato at Selected Shops in Ahmedabad

Shops	Weight per Fruit (gms)	Price (Rs./Kg.)	Appearance
Shop # 1 (C.G. Road)	60-80	14	Mostly red, some yellow Well developed, clean
Shop # 2 (Satellite)	60-80	14	Red, yellow slight bruised, clean
Shop # 3 (Ambawadi)	40-50	12	Red, yellow, bruised, soft, cuts
Shop # 4 (Jamalpur)	40-50	8	Red, yellow, heavily bruised, cuts

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