

Post-Harvest Management (PHM) of Horticulture Produce

Background note – preparing for Rabi Conference, 2016

India is bestowed with varied climate which ensures availability of fresh fruits and vegetables round the year. Though the country ranks second in production of fruits and vegetables in the world after China, the development of its supply chain was not strategically directed, for safe handling and to convey these perishable products to markets. A resultant demand supply mismatch has emerged for perishable produce, which contributes to price fluctuations and inflation. The inadequacy of technology aided farm-to-market logistics, also contributes to high losses in perishables, further adding to inflationary pressures and lowered value realization for farmers.

Developing efficient post-harvest management for horticultural produce has become a necessity, if we are to bring greater value to farmers, reduce food loss, ensure nutritional security, reduce inflation and meet our sustainable development goals.

Post-harvest activities are an integral part of the food production system, and its aim is to safe-guard the harvested value, extend its reach to market and empower the farmers with a choice of market. PHM enables this through a broad spectrum of operations that promote better practices in post-harvest handling and business linked management along the entire food supply chain. Efficient PHM extends the marketable life of fresh food, and in doing so, it allows more time for the produce to reach more markets, all the while maintaining freshness and quality. Most importantly, the system helps to link the farmers higher up in the value chain cycle, for maximum benefit and increase in their income.

All forms of post-harvest management, especially cold-chain, has a transformational impact on how farmers access and interact with markets. A working knowledge and understanding of the technical factors that impact on the safety, quality and value of agricultural produce, appropriate infrastructural support base, effective logistical networks, structured stakeholder interactions within post-harvest supply chains, and strategic government direction with allied support services are some synergistic prerequisites.

Major impediments to Post-Harvest Management

Post-harvest management infers that production become market linked. Therefore, it requires that the type of crop, its planting material, harvest cycles and times, the pre-conditioning and dispatch of produce, should be decided on the basis of predetermined destination points. Such decision making is optimally initiated at the first point consolidation, at source point, which is the modern pack-house. Developing such pack-houses effectively means developing the nerve centre of the fresh food supply chain. However, there are certain bottlenecks to such development -

1. Lack of technical training/extension facilities available to horticulture farmers; the focus on horticulture has been less than on traditional agriculture, even though horticulture is high value agriculture (HVA).
2. Matching infrastructure with cultivators' capacity; PHM infrastructure needs to be developed ahead of other production linked development, such as FPOs, cooperatives, etc. This adds a gestation period on the investment, until economy of scale is achieved.



3. Lack of market-linked quality indices – which impacts choice of type, stage of maturity for time and method of harvest; while the consumer is quality conscious, a scientific methodology or quality matrix is yet to be developed.
4. Lack of pack-house facilities also stems from a lack of relevant farm-to-market transport options; while a farm-gate PHM centre enable the produce to travel longer distances to more valuable markets, the lack of railways, reefer vehicles and waterways modes makes the efforts redundant.

In essence, there exists a need to have more cohesive strategies that add greater focus on high value agriculture with an approach to link farmers directly with national level markets. This includes developing the right kind of cultivars and planting material, providing appropriate capacity building and market linked extension services, creation of post-harvest infrastructure to directly connect farmers with wholesale markets and provide fiscal and financial incentives for the private sector to interact with small holder farms.

Role of government to overcome these issues

- Strengthening the supply chain infrastructure capacity in strategic areas, so that public and private sector organizations can develop the most relevant post-harvest services for bridging production areas with urban clusters, at domestic and international level.
- Leveraging India’s agricultural research and education network to build the technical capacity in horticulture of farmers, traders and other stakeholders, with good post-harvest handling as end-result.
- Developing, consolidating and disseminating information on post-harvest operations and maintenance through various means, including publications and the web-based Information Network on Post-harvest Operations.
- Enable access to multiple markets at a national level and to facilitate ease in trading horticulture crops.

Present Status

The “All India Cold-chain Infrastructure Capacity” (AICIC-2015) study conducted by NCCD-NABCONS, assessed demand and reported the gaps in end-to-end connectivity from farm-to-consumer. The overall status of cold chain infrastructure and requirement is tabulated as follows:

SN	Infrastructure Component	Existing Capacity (2014)	Approximate Requirement
1.	Integrated Pack Houses	250 numbers	70,000 numbers
2.	Reefer Transport	<10,000 numbers	62,000 numbers
3.	Cold stores (Bulk, CA enabled & distribution hubs)	32 million tonnes	35 million tonnes
4.	Ripening Chambers	800 numbers	9000 numbers

The report makes obvious that future focus should be for creation of pack houses, refrigerated transport, ripening chambers instead of standalone large cold storage projects. Cold-chain



development expected to disrupt and transform agri-trade and its impact is a continuous process and will require to be studied further.

ICAR network of Universities and establishments are adding more resources to horticulture studies and its related knowledge transfer to implementing bodies and farmers.

Government has launched a unified market mechanism in form of the e-NAM, preparing a platform that can facilitate physical movement and trade of all agricultural produce.

Government Schemes and Incentives

The Government is implementing the following schemes which have selective components aimed at strengthening the cold supply chain of horticulture, to increase market connectivity and thereby reducing food loss:

- Mission for Integrated Development of Horticulture (MIDH) - has a comprehensive set of components and allows investors to build-to-suit and avoid cost and capacity overruns. Promotes fresh whole food supply chain (agricultural produce) such that farmers can link directly with markets and accumulate maximum value.
- Scheme of Ministry of Food Processing Industries – promotes cold-chain across segments including horticulture produce, where destination includes food processing units. Processing units, if attached to the fresh food cold-chain, helps recover some value from non-marketable quality through transformative or additive mechanisms, where the farm produce is converted into product of industry.
- Scheme of Agricultural & Processed Food Products Export Development Authority (APEDA) – promotes cold-chain linked to international markets for agricultural produce, especially pack-houses for fresh fruits and vegetables.
- Scheme of National Cooperative Development Corporation (NCDC) – provides loans and venture capital to cooperatives in all sectors of agriculture, including horticulture.
- Fiscal & regulatory benefits – exemption from service tax to all activities such as preconditioning (sorting, grading, washing, waxing, packaging, precooling), transportation and storage of agricultural produce (fresh whole food where essential characteristics are not changes); Service tax exemption by way of knowledge dissemination of cold-chain; Capital investment linked deductions for Income tax (150%); zero value added tax on agricultural produce; excise and custom duty exemptions on certain equipment; 100% Foreign Direct Investment (FDI) is allowed under automatic route for setting up warehousing of agriculture products with refrigeration under automatic route; 100% FDI with FIPB approval route for trading, including through e-commerce, in respect of food products manufactured or produced in India.
- Reefer Vehicle Call-in-centre (RVC 1800-267-2663) for refrigerated transporters to call in and register operational or regulatory bottlenecks in transporting perishables.



Mission for Integrated Development of Horticulture (MIDH)

Under MIDH, financial assistance is provided for developing infrastructure and optimise operations of a wide variety of interlinked activities related to post-harvest management. For the development of post-harvest infrastructure, subsidy @ 35% (for general areas) and 50% (for hilly and scheduled areas) of admissible capital cost of the project is available for both public and private sector enterprises. The admissible components and maximum costs are identified strategically to drive holistic growth for overall integration, including in missing links. The scheme is demand/entrepreneur driven for commercial ventures and the Government assistance is back ended and also capped to the bank credit availed. A set of minimum system standards are to be followed to avail the benefits of this scheme. A unique aspect of MIDH is that it incentivises better practices and energy efficiencies in the cold-chain, including modernisation of existing infrastructure assets.

As of 31.03.2016, a total of 7395 cold storages had been created in the country with a total capacity of 34.05 million MT. Uttar Pradesh has the maximum number of cold stores created on record, followed by Gujarat, Punjab, Maharashtra and West Bengal. Maharashtra has the maximum number of pack houses followed by Karnataka, Chattisgarh, Andhra Pradesh and Odisha. State-wise data of reefer vehicles is not available as there is no separate registration of such trucks in Motor Vehicles Act; it is estimated that less than 10,000 actively refrigerated trucks exist in the country. In case of ripening chambers, these normally are distributed around major urban consumption centres.

The major states which have performed the best with respect to availability of cold chain infrastructures and its utilisation are Gujarat and Maharashtra. North eastern states are lagging behind and therefore there is a need for marketing and post-harvest infrastructure in these states. PHM development in States is indicated by physical and financial achievement. However, in future there is need to measure success through indicators of the throughput or capacity utilization of the capital assets created. Since PHM infrastructure is built and operated by private sector and support is provided on a demand driven basis, the monitoring and measuring of its capacity utilization will help develop other associated strategies.

As per records, the following 5 States have performed the best in PHM infrastructure creation and it is proposed that they present their case studies to other state representatives to accomplish their targets.

1. Gujarat
2. Maharashtra
3. Karnataka
4. Andhra Pradesh
5. Uttar Pradesh

The following states which have not performed well in creation of post-harvest infrastructure and are invited to present their concerns or bottlenecks in this aspect.

1. Assam
2. Bihar
3. West Bengal
4. Jharkhand
6. Odisha

A few important and recent case studies are worth mentioning as they demonstrate how PHM helps to expand markets and improves income of farmers. Gujarat successfully steered the use of idle cold store capacity in other states, for their potato in advance of market demand. Punjab spearheaded the opening up of new markets Southern India for a low value item like kinnow by using the cold-chain.

Key Benefits of PHM and Cold-chain

- Creation of PHM infrastructure **contributes to Gross Capital Formation in agriculture**, adding to overall development. Investment in PHM immediately adds value to the core domain, i.e. cultivation and marketing of produce. Under cold-chain and other post-harvest handling activities, the essential characteristics of produce is not changed by any intermediary; in effect, the value as harvested by farmer is directly linked with consumers. It not only retains farmers as part of the market linked value chain system but empowers them to spread their sales into new geographies.
- Modern **PHM brings about transformational changes to the way produce is traded**. At the first instance it promotes the consolidation of produce at farm-gate, thereby also **promoting collaboration and cooperation** at the back-end, including in cultivation. This effectively drives farmers to achieve a minimal logistical economy of scale, even for small land holdings.
- Modern PHM system **empowers decision making at farm-end** as produce is sorted by quality for markets. The mere presence of an aggregation and preconditioning centre at the back-end, effectively brings market linked logistics to farm-gate.
- Modern PHM management allows opportunity for the farmer to extend his/her market footprint as it **expands the saleable range of perishable produce**. It also allows opening up of new markets, where traditionally the produce could not reach.
- PHM reduces food loss by aiding market reach and use of technology aided logistics. **Reduced food loss** in the supply chain is a saving for producers. Because it creates a logistics bridge with markets, this in turn positively impacts **productivity at farms**.
- PHM infrastructure requires a certain economy of scale and therefore, it compels consolidation in production and handling of perishables. This in turn makes farming more collaborative and viable in the long run, both at the commercial and environmental levels.

Way Forward

All PHM development must be with the prime aim to generate improved value realisation for farmers, by enabling them with a choice of markets, across larger geographies and by reducing losses in the supply chain. Capacity building is needed so that PHM development is projectised, optimally across a series of market linking activities. There is need to promote synergy between the multiple sets of activities that end with the physical delivery of produce to markets. Stand-alone creation of infrastructure is not in line with the concept of integrated development of horticulture and should be dissuaded for the majority of crop types. Infrastructure creation should also be preferably linked to available quality of planting material and marketing support. A series of out-reach and awareness programmes about the schemes and advantages in horticulture are to be taken up in all media formats.

State wise distribution of Cold Store capacity (cold-chain) as on 31.03.2016

SN	Name of the State	upto 2009*		2009-10 to 2015-16						Totals	
		No.	Capacity (tons)	NHB		NHM		MoFPI		No.	Capacity (tons)
				No.	Capacity (tons)	No.	Capacity (tons)	No.	Capacity (tons)		
1	Andaman & Nicobar Islands (UT)	2	210							2	210
2	Andhra Pradesh & Telangana	290	900606	35	214659	96	596021	5	18000	426	1729286
3	Arunachal Pradesh	1	5000							1	5000
4	Assam	24	88068	9	56538			2	8100	35	152706
5	Bihar	246	1147041	28	111821	29	153233	2	4000	305	1416095
6	Chandigarh (UT)	6	12216	1	246					7	12462
7	Chhattisgarh	69	341885	14	68323	13	65349	2	9000	98	484557
8	Delhi	95	126158	2	3699					97	129857
9	Goa	29	7705							29	7705
10	Gujarat	398	1267304	47	152197	237	1131471	10	20000	692	2570973
11	Haryana	244	393121	38	143298	28	111376	8	48000	318	695795
12	Himachal Pradesh	18	19858	7	20504	19	41364	9	24000	53	105726
13	Jammu & Kashmir	19	42869	5	21900	5	29207	4	7000	33	100976
14	Jharkhand	45	170148	8	36757	4	19775	0		57	226680
15	Karnataka	170	407165	8	78844	11	43992	4	18000	193	548001
16	Kerala	193	58105	1	5000			2	15000	196	78105
17	Lakshadweep (UT)	1	15							1	15
18	Madhya Pradesh	197	808052	22	114580	71	320083	4	11000	294	1253715
19	Maharashtra	466	546748	27	98970	55	144142	27	92000	575	881860
20	Manipur	0	0					1	3000	1	3000
21	Meghalaya	3	3200	1	5000					4	8200
22	Mizoram	0	0	1	3471			2	1000	3	4471
23	Nagaland	2	6150							2	6150
24	Orissa	101	291039			65	232100	1		167	523139
25	Pondicherry (UT)	3	85							3	85
26	Punjab	422	1345193	55	176908	166	584902	12	45000	655	2152003
27	Rajasthan	110	324226	25	97401	20	83760	4	16000	159	521387
28	Sikkim	1	2000			1	100	0		2	2100
29	Tamil Nadu	148	238536	16	65047	1	6000	3	7000	168	316583
30	Tripura	11	29450	3	16027			0		14	45477
31	Uttar Pradesh	1589	10118000	495	2923310	157	907998	9	29300	2250	13978608
32	Uttarakhand	15	68499	5	9272	9	19150	15	52000	44	148921
33	West Bengal	463	5682000	14	47812	26	153699	8	57000	511	5940511
TOTALS		5381	244,50,652	867	44,71,586	1013	46,43,722	134	4,84,400	7395	340,50,359