"Railways mode of Transport for Cross-regional Trade of Perishable Agri-produce"

-Pawanexh Kohli (Chief Advisor & CEO of NCCD)

Background:

The country produces multiple crops across many States and production is increasingly developed in clusters so as to promote economy of scale at the farm-gate. This change is expected to grow with the formation of more Farmer Producer Organisations and through inherent impetus from Cooperative or collaborative farming practices.

Changed farming practices lead to the generation of large surplus of produce, regionally concentrated at the point of production. This local surplus is also since consumption is located in urban clusters, concentrated at a distance from producing areas.

In case of food grains, the surplus is captured by private sector (milling units) and through procurement by FCI and State government agencies. However, in case of perishable produce such as fruits and vegetables and other crops with lower holding life, the surplus is not procured and tends to go waste, causing loss of national resources.

As per a study commissioned by MoFPI to CIPHET of ICAR in 2015, the post-harvest loss of agricultural produce is 5% to 16%, which was assessed along various handling stages in a market-linked supply chain. This report is observed not to have considered the losses suffered in long haul transport having taken only the first mile transport handling into assessments. More importantly, the instances when post production surplus could not even enter the supply chain due to non-availability of logistics connectivity was not evaluated in this study. In such occurrences, unable to be directed towards a market, much of the surplus production is not evacuated from farms and this effects distress sales or is incurred as total food loss. Globally, the highest food loss and waste is reported in case of fruits and vegetables and is estimated upto 45%.

There are frequent reports of sustained demand of certain vegetables in large cities while the same crop is discarded alongside farms for want of market linkage. Coincidentally, most high perishable crops are also high nutrition foods and comprise the bulk of high-value-agriculture (HVA).

To help in doubling farmers' income and to make agriculture more sustainable, there is a need to develop holistic market connectivity for perishable and semi-perishable produce. Such connectivity would require cross-geographical flow of fresh foods and preferably involve multi-modal transport connectivity.

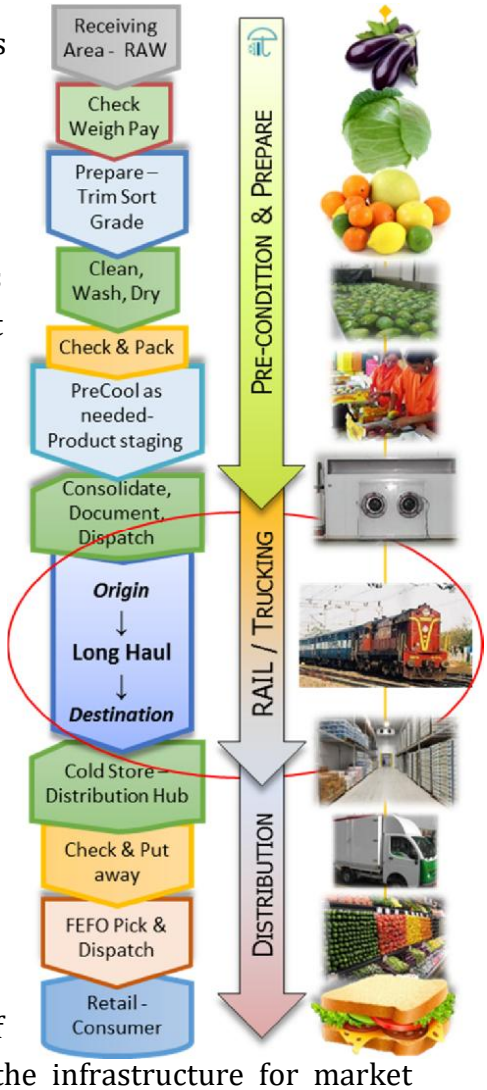
"Poor logistics connectivity is causing imbalance between demand and supply".

Observations:

Production is no longer the causal factor for demand-supply gaps. Instead, the need of the hour is to bridge episodic production with perpetual demand. A holistic logistics network for agricultural produce is essential, designed around key logistical activities so as to efficiently link an Origin (farm-source) with Destination (consumer-market) - OD Pair.

An agri-logistics network design will require, at first instance, the establishing of logistics source points. These are also referred to as aggregation centres or pre-conditioning centres and normally developed at village or rural level. The most common example is milk chiller collection points and in case of fresh produce, these are called pack-houses. This is the first step to value-realisation in a chain of market linked activities.

The Ministry of Agriculture & Farmers' Welfare has rationalised its schemes to proactively promote modern pack-houses, where produce is collected, grouped and packed into market linked assortments. Where needed, such pack-houses also undertakes washing, trimming, waxing, packing, labelling and pre-cooling. These activities do not alter or undertake value addition to the produce, but only prepares for travel to markets. However, this set of activities bring value to the farmer as it makes the produce more marketable in its fresh whole format.



> *Services by way of pre-conditioning, pre-cooling, ripening, waxing, packing, labelling of fruits and vegetables which do not change or alter their essential characteristics have been exempted from service tax. As no direct value-addition to the product is done, there is no incidence of VAT either.*

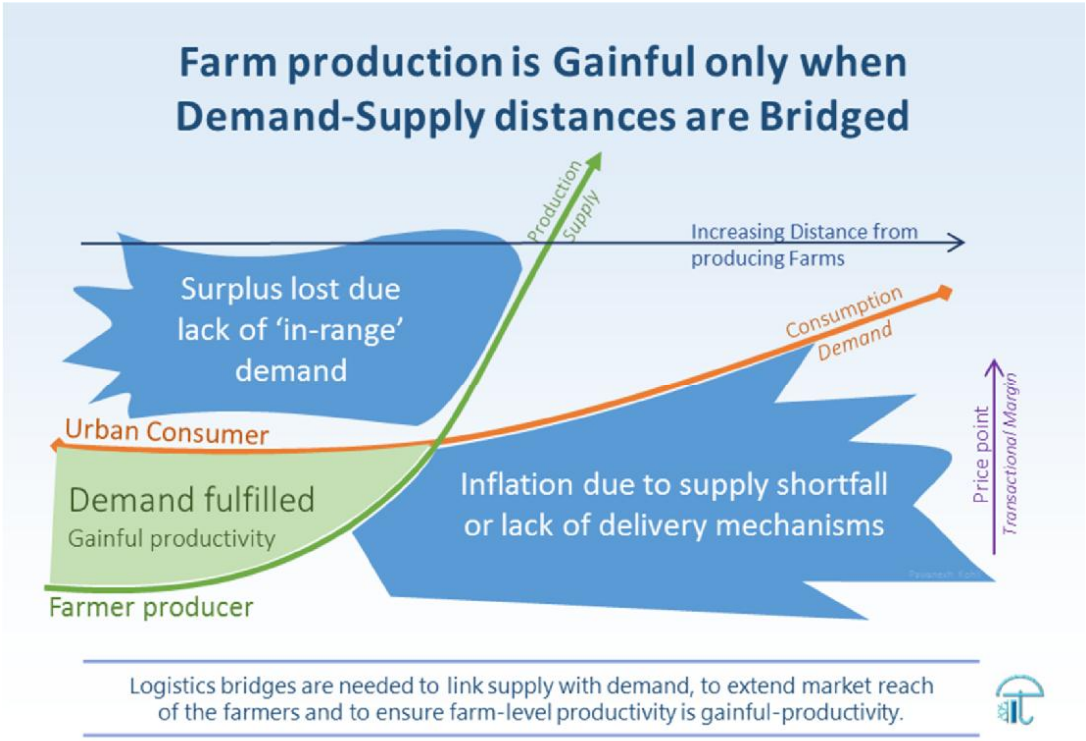
The next step is to evacuate the pre-conditioned produce to distant markets, thereby bridging the supply side with demand through providing transportation over roadways, railways, waterways and/or airways. The Ministry of Agriculture & Farmers' Welfare is actively promoting the infrastructure for market connectivity, such as reefer vehicles, multi-modal reefer containers, market infrastructure which includes cold stores and dry warehousing.

> *The services of loading, unloading, packing, storage or warehousing and transport of agricultural produce is exempt from service tax.*

Logistics connectivity between an OD Pair requires that both locations use some basic food handling facilities, preferably to enable unit load handling systems such as pallet-based material handling. This also minimises damage to the food items and mitigates handling losses, besides allowing for faster operations. Unitised load handling also permits the use of multi-modal containers as a future ready option. Various aspects of material handling equipment are supported by Ministry of Agriculture including automation, refrigerated containers, high reach lifts, etc.

All above aspects indicate that Railways can play an important role in the coming second green revolution, wherein railheads can locate the modern produce collection centres (or be linked to the same), maintain certain floating stock of containers dedicated for food cargo and to be the backbone to the Unified National Agricultural Markets. Railways not only speeds up the logistics connectivity, which is important in case of perishables, it also covers larger distances which is key to achieving improved value realisation for farmers.

"Railways can be a key player in bridging demand-supply & doubling farmers' income".



Agri-logistics, unified marketing and doubling farmers' income is a thrust area.

Need Assessment:

The movement of food grains has regularly used railways wagons and is an ongoing intervention on freight trains. Since majority of shipments are undertaken by FCI, bulk handling is possible. To compete with roadways and to bring more idle rolling stock into use, railways also developed discounts and incentives for carriage of food grains.

Railways also has an Automatic Freight Rebate Scheme to get freight in the traditional empty-flow direction. Yet, for perishables there is no evidence of similar positive focus.

The agricultural trade, especially in case of perishable commodities, faces a perpetual shortage of time, once the produce is harvested. The agri-logistics of such produce has to resort to technologies such as precooling and cold-chain to enhance the marketable or holding life of the perishable goods because of lack of market access in the normal lifespan of the produce. On the other hand, assured connectivity to market centres is not possible until a certain economy of scale is generated from a single commercial entity.

However, on the demand side, the volumetric consumption is well ascertained from various surveys, including through multiple NSSO rounds. For example, on a monthly basis Delhi consumes 11600 tons of banana, 18600 tons of tomato, 23500 tons of onion and 54000 tons of potato. However, none of these items are produced in Delhi and they are transported from neighbouring and/or distant regions. The example is similar for all major metropolis and their fresh food intake is routed from multiple sources and states.

All major city centres also have modern rail terminals and freight handling yards. These cities are easily identified as the destination of agri-produce freight. The point of origin are also fixed for certain crop types which are produced perennially, or have a short harvest window with longer holding life – eg. banana, apples, potato, carrot, kiwi, peas, etc. In such cases, the supply side or origin can be said to have a comparatively steady throughput outflow.

In many other cases, the supply volumes will shift depending on seasonal variations or because of shorter production cycles and a shorter holding life (more perishable) – eg. tomato, lettuce, mango, brinjal, okra, papaya, strawberry, pineapple, etc.

In both examples above, recent reports showcase that the surplus crops had to be discarded on the wayside, while unsated demand in faraway cities resulted in price inflation. This clearly indicates that effective logistics bridges were critical missing links between the points of surplus and demand.

"A scheduled, fixed route service will promote and spearhead the development large volumes along identified freight lanes".

Operational Requirements:

This vision of technology affecting the food supply chain has following key aspects to consider:

1. Aggregation facilities with efficient transport linkage. The link provides a network as to bring the market within reach of the producer.
2. The logistics has to cater to the requirement of a rapid and trustworthy transport mode, and where required to provide ambient conditioning.
3. With most fresh perishables, the primary need is provision of transport, with storage at receiving front-end. Fresh perishables must not be stored at production centre, but moved to demand side while still young and firm to withstand rigours of transport.

Indian Railways with its pan-India network is the optimal and preferred choice for Horti-produce movement. Yet, this burgeoning demand is not fully tapped or planned for in full.

Most of proposed agri-hubs are remote from railways linkage or have difficult access to them. The railways itself has minimal options for servicing the thermally managed movement of fresh and frozen produce, leaving that growing service need to the road transport segment.

For Railways to tap into this growing transport demand from agri-logistics -

1. Upgrade logistics to facilitate the supply chain of fresh produce - agri-hubs or handling facility adjoining railway sidings for loading unloading.
2. Provide the use of railways communication network to aid price transparency to farmers & markets.
3. Create Receiving hubs from where local secondary or tertiary distribution can be handed over to road transport.
4. Provide Links to export hubs, including to streamline current export delays. This can be done in liaison with APEDA and MPEDA and other export promoting bodies.

Primary Advantages to Indian Railways-

1. Assured income from logistics service from agri-hubs. Any producer with efficient and easy access to rail transport will rarely opt for long haul roadways transportation.
2. Income from railway land on which agri-hubs will be established. Land with railway sidings can be leased to proposed users under PPP mode or through outright sale.
3. Service to the nation- with temperature controlled transportation, railways will have developed an enhanced ability to provide emergency services at times of disaster by serving as effective supply chain of fresh food including perishable medical supplies.
4. Upgradation of railways equipment and work-force. This will add value and fresh skills to both people and the railways service.

Current status of Rail inked infrastructure with Indian Railways or with CONCOR (Container Corporation of India):

SN	*Description*	*Nos*	*Remarks*
1	Modern Pack-houses	Zero	Used for aggregation or collecting of produce from farms. Produce is pre-conditioned for travel by sort and packaging before precooling. These can be outsourced to off-site locations or established at railways land adjoining railheads.
2	Reefer transport	Zero	Used to link pack-houses with next chain of distribution. Can be outsourced to transporters. For certain produce like potato, ordinary trucking will suffice.
3	Distribution Hub (Cold warehousing)	1	Used for transient warehousing for produce while waiting rail connectivity. Can be used for stuffing containers in advance for container trains and destuffing service. 1 of 1430 tons created in Bengal near Singur railway stn.
4	Containers	98	Insulated but Ventilated containers with CONCOR and were earlier in use for onion and banana movement. Procured with funds provided from NHB. Currently not used for any trade.
5	Reefer Containers	Zero	No refrigerated containers are available for domestic users – hence mutli-modal refrigerated transport is not possible.
6	Refrig. Parcel Vans (VPN)	10	These were reported in partial use (2016).

Private Container Train Operators (PCTO) also do not service the domestic cold-chain.

All aspects of technology aided agri-logistics is supported under schemes of the Ministry of Agriculture Cooperation and Farmers Welfare. These include pack-houses with precoolers and staging cold rooms, reefer vehicles, reefer containers (TEUs), refrigerated warehousing, material handling systems, storage and racking systems, etc. This provides railways and/or partner organisations the opportunity to build-to-suit facilities that can be designed to avoid capacity and cost over-runs.

Operating Models:

Broadly two methodologies can be considered for establishing pan-India rail-based network for fresh produce supply chains. In one, the existing infrastructure can be utilised – first mile truck to rail-side **à** load onto wagons **à** long haul on rail **à** off load

at destination **à** short haul to buffer storage by truck. This can be used for non-specialised movement of bagged and hardy vegetables such as onion and potato.

For perishable produce, where delivery can be managed within 24 hours, enclosed carriage on VPNs can also be carried out. For specialised commodities, requiring temperature controlled carriage and storage, refrigerated containers are required. Since such movement will be on container trains additional handling facilities will be required at loading and offloading rail-siding (CRTs).

It is proposed that a predetermined schedule be run to induce volumetric throughput from users/buyers. A special consideration may be given to traders who have registered with eNAM and are intending to move the produce over more than 800 kms.

A detailed study is recommended for long term planning purposes. However, with purpose to spearhead the initial freight the following observations are to be considered.

> A north to south perennial flow of apple and potato is already established. Similarly, there is south to north perennial movement of bananas, chicken, lettuce, etc. Majority of this is occurring over trucks and reefer trucks and gives opportunity to convert this trade into rail-based containers.
>
> On the West to East direction there is large movement of Amul products via trucks and return loads are not fully established. However, opening a fixed schedule of one or two containers will facilitate market linkage from North Eastern region.

It is important to realise that unlike most of the bulk freight on railways, in case of fruits and vegetables large volume shipments impact market dynamics as receiving ends are not able to handle large supply. Hence, for the purpose of conceptualising horti-produce rail links, it may be necessary to consider piecemeal or partial rake loads. Therefore, this will require having compartmentalised wagons or containers, attached to existing rakes.

To assist the development of such trade, the ongoing scheme for fresh produce infrastructure will be targeted for freight forwarders who wish to scale up shipments through railways. As such, a system based approach would be promoted.

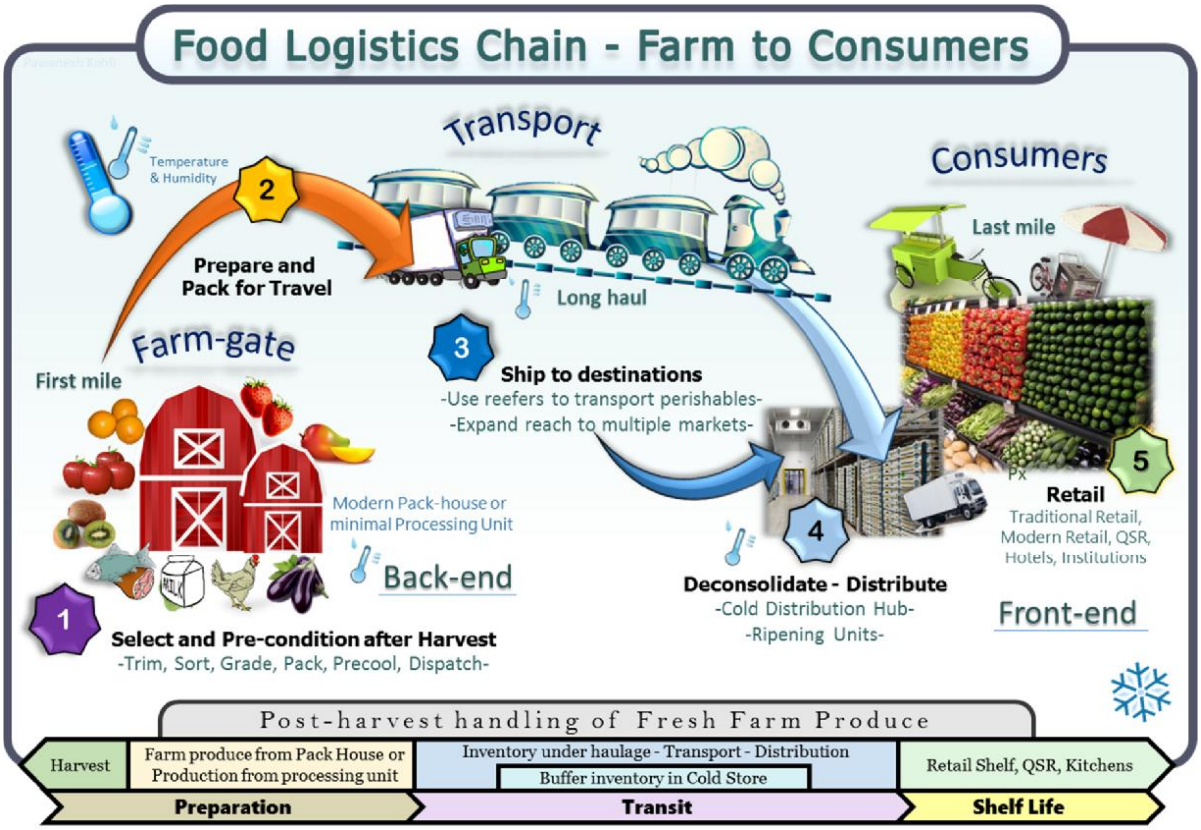
Two options can be considered for a predetermined time period:

1. Use covered rail wagons or VPNs 2. Promote reefer container movement

For both options, a time table of available capacity can be published and publicised for freight forwarders and other stake holders to take advantage of. Once cargo volume is scaled up, other infrastructure development can be undertaken.

The ability to use railways to cover longer distances in shorter times, empowers farmers by allowing them to expand their market reach. While existing trade into local markets

will continue, the amount that is surplus to localised demand can be connected to consumers farther away thereby mitigating loss and increasing recovery from surplus. Otherwise the surplus produced is incurred as total waste.



Previous Reports:

The report of the National Transport Development Policy Committee (Planning Commission - 2014) had also stated that most of thinking on transport in India had been project-centric done in single-mode silos. The recommendation is to have a system based approach, cutting across modes of transport and geographies. The report also mentioned relative transport isolation by region, in specific North East Region (NER).

In this concept, it is felt that sector-wise there is a relative transport isolation in the agriculture sector, especially for horticulture. As a first step to total multi-modal transport system for horticulture, the integration between railways and roadways modes for perishable goods is conceivable in the short term.

The Planning Commission's "Total Transport System Study on Traffic Flows and Modal Costs" by RITES, published in March 2008, highlights certain key aspects such as average lead time and share of various products on railways and road.

TOP 21 COMMODITIES BY VOLUME MOVED BY RAIL AND COMPARATIVE ROAD SHARE

SN	COMMODITY NAME	TOTAL (All Modes)	MODAL SHARE			
			RAIL		ROAD	
		MILLION TONNES	MILLION TONNES	% OF TOTAL	**MILLION TONNES**	**% OF TOTAL**
1	Coal	415.37	331.77	79.87	68.35	16.46
2	Iron ore	154.69	121.80	78.74	23.30	15.06
3	Cement & cement structures	157.86	78.83	49.94	75.98	48.13
4	Chemical manures & fertilizers	54.57	36.38	66.67	18.19	33.33
5	POL products (liquid)	189.56	35.13	18.53	128.14	67.60
6	Iron & steel (all types)	134.49	27.31	20.31	107.18	79.69
7	Containers (loaded & empty)	85.44	27.10	31.71	56.60	66.25
8	Rice (all types)	69.54	22.43	32.25	47.12	67.75
9	Parcels, miscellaneous & others	227.17	22.29	9.81	201.50	88.70
10	Limestone & dolomite	19.85	13.69	69.00	6.15	31.00
11	Wheat and wheat flour	41.67	12.31	29.54	29.36	70.46
12	Granite, marbles & other stones	31.97	6.79	21.24	25.18	78.76
13	Sugar and khandsari	24.84	5.98	24.08	18.86	75.92
14	Ores other than iron	14.68	5.49	37.40	9.19	62.60
15	Building materials	121.13	5.05	4.17	116.08	95.83
16	Salt	11.06	4.62	41.77	6.44	58.23
17	Other food grains	15.29	2.29	14.98	13.00	85.02
18	**Fruits and vegetables**	**71.81**	**1.89**	**2.63**	**69.93**	**97.38**
19	Wood, timber, plywood, etc.	33.91	1.14	3.36	32.77	96.64
20	Chemicals (Powder & liquid types)	34.90	1.11	3.18	33.79	96.82
21	Edible oils	26.36	1.09	4.14	25.26	95.83
	Sub-Total	**1936.16**	**764.49**	**39.48**	**1112.37**	**57.45**
	TOTAL ALL COMMODITIES	**2386.97**		**32.03**		**46.60**

Planning Commission Total Transport System Study

In case of fruits and vegetables, 97.4% of volume moves on roadways. It is to be noted that this fruit and vegetables have the lowest share with railways among the top 21 commodities.

MODE-WISE AVERAGE LEADS OF 52 COMMODITIES

SN	COMMODITY	MODEWISE AVG. LEAD (KMs)				AVG - ALL MODES (KMs)
		RAIL	ROAD	COASTAL SHIPPING	AIRWAYS	
1	Rice (All Types)	1294	327			639
2	Wheat and Wheat Flour	1375	437			714
3	Other Food grains	895	370			448
4	Grams & Pulses	1261	607			619
5	Sugar and Khandsari	997	462			591
6	Sugar Cane	88	136			133
7	Oil Seeds (All Types)	1155	576			598
8	Cotton (Raw & Mfd)	1633	576			583
9	Jute and Coir (Raw & Mfd)	1585	697			758
10	Rubber (Raw & Products)	1888	574			574
11	Fodder	1742	415			452
12	**Fruits and Vegetables**	**1653**	**522**			**552**
13	Tea and Coffee	478	750			750
14	Tobacco & Products	250	645			645

SN	COMMODITY	MODEWISE AVG. LEAD (KMs)				AVG - ALL MODES (KMs)
		RAIL	ROAD	COASTAL SHIPPING	AIRWAYS	
15	Wood, Timber, Plywood, etc.	737	450			460
16	Iron Ore	437	304	2965		574
17	Ores other than Iron	478	350			398
18	Coal	581	463	1271		587
19	POL Products (Liquid)	658	272	1163		467
20	Coal tar and Bitumen	1204	399			521
21	Limestone & Dolomite	676	438			602
22	Salt	1452	480			886
23	Granite, Marbles & other stones	331	551			504
24	Cement and Structures	557	358	552		461
25	Building materials	327	153			160
26	Chemical Manures & Fertilizers	834	373			680
27	Iron & Steel (All Types)	936	525			609
28	Metals other than Iron & Steel	575	477			479
29	Edible Oils	1519	538			579
30	Chemicals (All Types)	943	611			622
31	Paints & Dyes	758	627			627
32	Electricals (Incl. Wires)	810	614			614
33	Cloths Raw & Manufactured	1629	601			601
34	Leather & Goods (Incl. Bones)	564	545			545
35	Gas Cylinder - All Types		151			151
36	Paper & Paper Products	2044	545			571
37	Plastic & Plastic Goods	2070	611			612
38	Car, Vans, etc.	2025	810			868
39	Cycle & Cycle Parts		729			729
40	Heavy Machinery (Agr. Equp.)	1345	595			596
41	Three Wheelers		739			739
42	Two Wheelers		728			728
43	Tyre and Tubes	2489	673			673
44	Spare Parts (All Types)	1763	568			569
45	Empty Tins, Bottes, Drums, etc.	311	374			374
46	Provisions & Household Goods	2095	535			539
47	Containers (Loaded & Empty)	1250	306	664		613
48	Fish/Egg/Meat	476	600			600
49	Livestock	1529	215			234
50	Milk & Products	2223	160			165
51	Scrap (All Metals)	1188	455			465
52	Parcels, Misc, Others, etc.	720	628	1408	1027	648
AVERAGE OF ALL MODES		**661**	**453**	**1450**	**1027**	**545**

Planning Commission Total Transport System Study

Among the top 52 commodities, the average lead time or travel time is about 500 kms, mostly (97%) by road. It is reiterated that long haul movement can be greatly facilitated by scaling up rail based movement of fruits and vegetables, which will help farmers capture more markets and therefore become more productive in gainful terms.

Above data s from 2007-08 but it is expected that the status is similar in 2016. It is therefore inferred that in case of perishable crops, which can benefit greatly with market linage from reduced transit time and improved travel conditions on rail modes, is not able

to take advantage of current rail system. The reason can be because of lack of suitable handling facilities but mostly from there being no special focus to capturing such freight.

- Currently majority of Food Grains and certain quantum of tea, potato, onion moves on railways wagons. These Wagons are not designed for sensitive or temperature controlled transport.
- Very small quantum of fruits & vegetables avails rail transport, as the past approach has been to evaluate full train loads, instead of breaking down into smaller unit loads.
- Container trains allow the opportunity to consider a smaller unit load of container, instead of full train loads only – a container train can load multiple commodities types and stuffing can happen in advance to train arrival.
- A floating stock of containers, for on demand use can be located across terminals and carried on empty slots of existing routes. Such individual containers can be used for multiple loads types interchangeable along a series of freight lanes, promoting multi-modal format for agri-logistics.
- Two types of freight systems are expected – 1) for hardy produce such as potato, tea, ginger, spices, etc. where long distance connectivity is more of essence. In such cases the receiving end is also not expected to be specialised. 2) for more perishable produce such as mangos, bananas, pineapple, brinjal, tomato, etc. where time is of essence and requires temperature controlled handling facilities to stud and destuff the containers.
- In the first instance, railways system would only be used to freight the aggregated crops for an offsite wholesale yard or receiving facility. Railways wagons (covered type) could also be used.
- In second case, special refrigerated containers would be the unit load for transport and the receiving facility may require refrigerated cross-dock or storage options – offsite or at railhead.
- To spearhead use of railways for movement of horticulture produce, partial or piecemeal movement will have to be started. This may manifest, preferably, in form of reserved parcel van freight or single container freight on existing lanes. The pre-reserved option can be opened on select routes for a fixed time window of two years.
- As a full unit load is achieved, with reverse logistics, the opportunity can be passed on to other service providers such as PCTOs (Private Container Train Operators).
- Fixed lanes between North to/fro South and West to/fro East are possible. It is envisaged that a regular freight service will promote the use of railway mode for horticulture transport and develop the appropriate eco-system of freight forwards/aggregators.
- DAC&FW is already promoting the setting up of modern pack-houses as aggregation points, reefer transport including rail containers and warehousing for distribution purposes with material handling equipment.

Conclusion:

1. There is definite advantage to use rail-based long-haul of fruits and vegetables.
2. There appears to be ample scope to promote rail mode of domestic transport for fruits and vegetables and other perishable food items.
3. Initially, a weekly schedule on fixed lanes can be spearheaded for perishable fruits and vegetables.
4. These lanes can be initiated on railways wagons or on container trains (CONCOR or Private operators) – in north-south and east-west direction.
5. The initial freight volume, is expected to be piecemeal or less than rake load.
6. Freight forwarders can expect to initially book less than a container or VPN load on predetermined scheduled runs.
7. As volumes are scaled up, necessary development in terms of other associated handling infrastructure can be subsequently planned.
8. Publicity can be given to a two year window of rail-based service offering to promote users, while scheme based support for agri-logistics infrastructure to private sector can be used to drive entrepreneurial interest.
9. A focused study to assess the scope and infrastructure requirement could be undertaken for long term development of multi-modal carriage of perishable goods.

This report is prepared with intention to promote discussions and bring greater focus to the need for multi-modal (roadways, railways, airways, waterways) applications in cold-chain.

About National Centre for Cold-chain Development (NCCD): NCCD is an autonomous body set up by the Government of India with the aim to serve as a think tank, to facilitate cold chain development across all user segments through policy intervention, capacity building and standardisation. NCCD has participation from private industry, policy makers, knowledge partners and other government agencies. Functioning under PPP model of operations, NCCD partakes through senior expertise from industry, academia, researchers, farmers and other stakeholders. The CEO of NCCD is a professional drawn from the industry who also serves as Chief Advisor to the Ministry of Agriculture & Farmers Welfare on agri-logistics matters.

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