Analysing NDDB Cluster model for marketing of Vegetables

1. Introduction

India is the world largest producer of many vegetables but there still exists huge gap between per capita demand and supply due to enormous waste during post-harvest handling & marketing. These losses are a missed opportunity to recover value for the benefit of farmers. The deploying of appropriate strategic and operating models, will allow the efficient closure of gaps between demand and supply so as to contribute to doubling farmers' income.

The gap between demand and supply is due to ineffective market links, poor handling and lack of consolidation on both the demand-side and supply-side. On the supply side, the government has agenda to promote modern cultivation practices and collaborative farming. On the demand side, the government has example of NDDB's vegetable marketing initiative, ie. Mother Dairy Fruit & Vegetable Pvt Ltd (SAFAL).

2. Post-harvest Supply Chain systems

Supply Chain Management represents the management of the entire set of production, manufacturing/transformation, distribution and marketing activities by which a consumer is supplied with a desired product. Post-harvest supply chain encompasses the planning and managing of all activities involved in procurement, preconditioning, and delivery system of farm produce.

Marketing of horticultural crops is quite complex and risky due to the perishable nature of the produce, seasonal production and bulkiness. The marketing arrangements at different stages play an important role in price levels at various stages viz. from farm gate to the ultimate user. These features make the marketing system of vegetables to differ from other agricultural commodities, particularly in providing time, form and space utilities. While the market infrastructure is better developed for food grains, but vegetables markets are not that well developed and markets are congested and unhygienic.

Generally, the middlemen and wholesale businessmen purchase the Agricultural products from the farmers at a lower price. In turn, fresh vegetables and fruits purchased at the lower price from the farmers are sold out to retail businessmen at higher price and the retail businessmen sell those Agricultural Products further at higher price to the consumers. As a result, the farmers get only the lower price for their produce whereas the consumers have to pay higher price for the same produce. Vegetable farmers are the most vulnerable. Even if prices soar to one of the highest levels, they only get a third or fourth of the prices in retail markets. Vegetables are a perishable commodity; therefore, retailers can't take the risk of losses from

leftover vegetables, which will be of no value after a few hours. At urban retail markets, onions, tomato, cabbage and cauliflower are being sold for Rs 80-120 a kg, three-four times the prices farmers get. For farmers, input costs have been rising and in turn growers do not get value to produce. High inflation has generated cost pressures and this has also impacted profits.

Supply chain development not only benefits the private sector but also creates spin-offs that stimulate social, economic and environmental sustainable development in the region (employment generation, added value, minimization of product losses etc. The specific gains are:

- Reduction of product losses in transportation and storage.
- Increasing of selling radius and revenue from sales.
- Productivity Improvement
- High customer satisfaction
- Increased profit
- On time delivery
- Tracking and tracing to the source
- Better control of product safety and quality
- Better information about the flow of products, markets and technologies.
- Transparency of the supply chain.
- Dissemination of technology, capital and knowledge among the chain partners
- Large investments and risks are shared among partners in the chain
- Gross Capital Formation at back-end and in agriculture allied business

3. Summary of NDDB model (Dairy and Vegetables):

The NDDB (National Dairy Development Board) model can be understood in its 2 main product formats – for Milk and the case of SAFAL for fruits & vegetables (Delhi-NCR centric).

a) DAIRY model

In the case of milk, the model is centred on Farm to Market collaboration through Cooperatives of farmers for –

- Milk procurement at rural gate
- Milk treatment and packaging at processing unit
- Dairy product distribution to consumer-gate (this can be through 3rd party channels)

The model is based on empowering farmers in the form of collectives, such that a village centre receives raw milk from a local cachement of famers. The receiving centre

at first mile has recourse to technology in the form of assaying kits and refrigerated milk-chillers (200 to 600 litres) to facilitate handling, paying and short term storage of the milk. The milk is thereafter picked up for delivery to the processing unit (depending on distance, a bulk milk chiller at processing unit can directly receive fresh milk from farmers). The energy needs at the first mile facility is powered by the electricity grid or using bio-gas/bio-mass systems. The milk is collected and delivered to the processing unit on a daily basis, mostly twice a day.

The processing unit forwards the milk to market after appropriate heat treatment (pasteurisation) and packaging (poly-pack, tetra-pack, tankers), as well after converting surplus into other dairy products (milk powder, butter, ghee, etc.). Processing facility may also supply milk to other food processing units that use milk for secondary products (chocolates, beverages, sweets, ice-cream, etc.). Marketing is done by the processing facility as the new owner/producer of the saleable product, with the farmer having realised value at first instance where custody of milk is handed over to the supply chain.

The operating model is amenable to milk supply as the raw produce (unprocessed, unpasteurized milk) is in a homogenous format (liquid) and technology exists to promptly assess and categorise the price of raw milk on the basis of quality factors (fat, protein, solid contents). Milk Co-ops manage the procurement from small and marginal producers and NDDB also facilitates the setting up of milk producing companies to secure their raw milk requirement. The marketing of the final saleable products varies depending on each product type. Fresh milk (and by-products) is retailed through franchisee or owned outlets and/or through existing retail/distribution channels. Mother Dairy (wholly owned marketing subsidiary of NDDB) sources milk & other products under its brand from various Milk Coops, Milk Producing Companies and from local SHGs for the Delhi NCR market. The last mile supply of milk is replenished on need, which is on a daily or more frequent basis. A similar model is pursued in other States through federations of Marketing Coops/Organisations.

b) VEGETABLES model

On seeing the success in milk supply chain, Mother Dairy Fruit & Vegetable Pvt Ltd (SAFAL) was especially conceived to adapt and replicate same in the marketing of vegetables and fruits. The SAFAL model is primarily as follows –

- Procurement on receipt of supply from farmers at Delhi hub
- Distribution operations from Delhi hub
- Retail to consumers from owned outlets
- Backward linkage through extension work on quality requirement and handling

In case of SAFAL (Mother Dairy Fruit & Vegetable Pvt Ltd) the main operations (procurement and marketing) are adjusted for non-homogeneous produce type. A key difference in the SAFAL model is, that unlike NDDB, there is no active village level development of producer cooperatives and instead area stations are set up by local associations. Through these area stations extension services for production is promoted and they serve as daily aggregation platforms of the harvested produce. The aggregated produce from these area stations is loaded onto ordinary trucks for onward delivery to Mother Dairy's (SAFAL) location, the Mangol Puri distribution centre (DC unit). This activity is by local association of farmers, who are responsible for transport and delivery to SAFAL's DC unit at Mangol Puri in Delhi.

SAFAL deals with approximately 180 farmer associations (with membership of approx 8000 farmers) and formal contracts are not the norm. The farmer's association manages local procurement from its members and the transportation link to SAFAL DC unit. However, SAFAL provides support by facilitating tender/contracts for transport services where needed, for the associations. Similarly, selection of crates and weighing machines for use of the associations is facilitated through SAFAL. SAFAL also has agriculture extension workers on call to support farmers linked to the area stations by providing extension services on good agricultural practises. Notably, there is no formal contracted arrangement with SAFAL and farmers.

On receipt at the Delhi (Mangol Puri) distribution hub, the produce is segregated into demand based lots for each outlet in Delhi, for the subsequent last mile distribution. SAFAL sells approximately 350 tons/daily in the Delhi NCR market, sourced from across 16 States. SAFAL also makes 12% of its procurement from the local mandis (Azadpur mostly) to buffer against variations in its sales forecast. In addition, another 4% to 5% amount is also procured from the local mandis for certain low volume or off-season produce (where demand is too low to justify long haul freight but customer satisfaction is targeted). Hardy items like ginger, onion and potato, is sourced from APMC mandis at the growing areas - SAFAL maintains a low inventory cycle to minimise its own storage, through fast turn-around from its retail outlets.

The entire life cycle from farm-to-consumer is majorly handled in the open ambient, without any pre-cooling at farm/village level. This is possible as the farm to consumption handling is fast-tracked in less than a 48 hour timeline. As also discussed in NCCDs reports, cold-chain facilitation within a 300 km radius is not always necessary where the farm to consumer marketing cycle is within the normal holding life of the fresh produce, unless quality is a main concern or produce holding life extension is required. However, when the demand for quality is of concern, the use of

reefer transport and associated handling can be considered. This requires differential pricing and marketing of the produce.

SAFAL has around 390 outlets, the average floor size is 400 ft^2 and entails investment of Rs. 7 to 10 lakhs for its infrastructure. The captive retail is fed from handling capacity at SAFAL DC unit for supply of fresh fruit & vegetables - cold storage for fresh produce of 480 tons storage capacity, with 5x space for production hall (for handling staging and dispatch area); and 175 tons for Ripening unit. The average waste from handling at Mangol Puri unit is reported at less than 2.5% (however, this may not be indicative of the losses incurred at farm-gate and during transport).

The dispatch from The SAFAL hub to various retail outlets is twice a day and the docks are worked 3 shifts in a day. SAFAL manages its own route planning for last mile distribution to its retail outlets. On a price transaction, SAFAL does not bring additional advantage to farmers since it pays them the same "Azadpur mandi" rate for quantity/quality delivered. However, it retails to consumers from its captive outlets at market linked retail prices.

4. Suitability of adopting NDDB model for marketing of vegetables:

The NDDB model for handling milk cannot be adopted directly for the purpose of handling of vegetables. The main difference is that milk is homogenous for handling purposes, which allows it to be easily consolidated into any container type for safe transport to the packaging and processing unit. In the case of fruits and vegetables, the produce is of various sizes and shapes, requires individual handling at first instance of aggregation, before they can be dispatched for onwards distribution and marketing. This therefore requires specifically designed post-harvest receiving & handling stations at the back-end (rural-gate or farm-gate).

Mother Dairy Fruit & Vegetable Pvt Ltd (SAFAL) was especially conceived to adapt and replicate the successes seen in the milk supply chain into marketing of vegetables and fruits. Some minimal adaptions needed for the purpose of handling fruits and vegetables are already evidenced at SAFAL - the learnings since its inception can be suitably documented (operating model and standard procedures) and made common domain knowledge for the benefit of new entrepreneurs or for setting up similar marketing networks in other cities. At the moment the SAFAL model facilitates farmer associations by becoming an assured buyer, and thereby justifying investment by farmers association in its aggregation point (primarily weighing machine, crates, covered area, manpower).

The main strength of SAFAL is its established outlets (approx 400) which assures a predictable throughput or sales volume. Against this fixed sales volume, SAFAL is able

to undertake assured procurement and build relations with farmers associations, despite not underwriting the arrangement with legal contracts. This system has allowed SAFAL to become a market linked model for the limited number of farmers it procures from. To replicate this pattern of benefit to farmers, SAFAL will need to expand its retail footprint so that, in turn, it will need to procure more produce from more farmers.

SAFAL supplies about 4% of Delhi NCR consumption only (about 315 to 350 tons per day). It has maintained this status quo for almost a decade and the enterprise foot-print can be considered for upscaling. This can tactically be done, either within the existing NCR area by targeting a larger share of the demand, or by expanding its spread of operations into other towns and cities. Alternately, marketing organisations under State Marketing Boards can partner with SAFAL to share business operations.

However, SAFAL does not undertake any pre-cooling or specialised storage/transport from procurement centres till point of sales, for fresh fruits and vegetables handling. It has limited or no formal arrangement with the back-end - effectively SAFAL serves as a superior marketing model (assured evacuation) for perishables from market-proximate producing areas. SAFAL also procures from distant markets in case of onions and potatoes where need of technology is minimal. Therefore, the learning from current operations do not translate into knowledge where modern post-harvest management in form of back-end preconditioning (sorting, grading, packaging, pre-cooling and reefer transit) is required - i.e. long distance procurement of exotics or off-season high value produce.

SAFAL had forayed into Bangalore market by opening a SAFAL F&V Auction centre. The Delhi model was changed into that of a terminal market and the original plan comprised a central auction facility with 100 wholesale shops, a 10,000 tonne capacity cold storage for bulk produces like potato. Initially managed by NDDB, the intention was to gradually involve farmers' associations to become partners in the project. The backward linkage for F&V would be through 42 collection centres, to be set up in the local farm produce growing areas. The forward linkage was planned through 8 to 10 cash-and-carry grocery stores to be constructed at strategic locations in the city, in addition to four such stores at the auction market itself. The model, without own captive retail as was the case in Delhi, required competing with existing wholesalers and hence did not meet related success.

The low level of success at Bangalore is inferred largely due to the changed business approach, wherein SAFAL did not set up own outlets and resorted to emulating existing wholesale into non-captive retail.

Model	Description
NDDB – Dairy model	Production to retail is operated by Coops/Federations. Raw milk is sourced from producing organisations/SHGs from village centres. Homogeneous produce is marketed after treatment or is processed into milk products. Coop manages branding and market connectivity. Marketing is through multiple retail channels.
SAFAL – Vegetable model	De-risked from production as farmers are paid on successful delivery to city centre. Farmers associations manage back-end aggregation and transport against assured market demand. Onward last mile distribution through owned outlets is managed by SAFAL.

However, the HOPCOMS network of retail in Bangalore, which emulated the SAFAL Delhi model by establishing own retail, has met relatively higher success. HOPCOMS also channelizes the demand into indents to the back-end. Thereafter, farmers on their own arrange supply as per indent, to deliver to the city based DC. The HOPCOMS model differs from the SAFAL Delhi model as it pays higher than the reference mandi prices to farmers (HOPCOMS also offers a minimum support price in times of distress). HOPCOMS also provides opportunity for farmers to hold and directly sell to consumers at certain collection centre locations.

The city-proximate production cluster has the advantage of immediate access to a large market centre. This ensures low connectivity cost and higher transaction level margins. The volumetric growth is restricted or linked directly to localised demand.

5. Causes of instability in onion, tomato and potatoes in market:

On enquiring from SAFAL team on causes for instability in market level prices of said crops, it was informed that a key aspect was the vagaries of consumers. As per SAFAL, the consumer is always willing to explore new price point opportunities – case in example informed was recent supply of low quality onion from Rajasthan which in turn lowered the price of good quality supply from Nasik. This example was indicated in each case, as the customer was not loyal to quality parameters. It is felt that this may be prevalent because the country does not have any major fresh produce brands and price point at retail was defining demand rather than quality perceptions.

Another reason for instability in supply, stems from availability of transportation and this too gets reflected in market prices. Every month-end the demand for trucking fluctuates because of inventory cycles of consumer durables and other goods. As the same trucks are used for food shipments, a certain instability arises from lack of transport availability. Similar shortage in transport also manifests at times due to

other reasons, depending on market manipulation, weather vagaries, local disruptions, etc. which are not always captured by marketing organisations.

The price discovery, is centred on those quoted at Azadpur mandi, which are dynamically ascertained on a daily basis. SAFAL, a long standing organisation, also prides itself for being guided by Azadpur for procurement prices. Effectively Azadpur defines the returns to the farmers. SAFAL, a member of APMC, has special waiver on mandi commission.

Any fluctuation at Azadpur immediately reflects in knee jerk pricing at farm-gate and has a cascade effect at front-end. This provides opportunistic or differential pricing options within the value chain system. The opportunistic framework is customary in most produce types and gets amplified in those with high volume sales. Onion, tomato and potato form almost 50% of the total F&V sales (SAFAL reports that on average onion and potato is 30% of sales). Being high volume items, these food items show lower bottoms and higher tops when subject to price instability.

It is to note that potato and onion inventories are longer term and there is advance information in the market on remaining inventory (from potato cold stores or onion farm-gate storage). However, this advance market-intel is not validated or updated with regulators for monitoring purposes. Such information in the hands of a few can be easily manipulated for transactional gains. In case of tomato, the situation is more dynamic as tomato selling cycle is shorter. Short term life cycle of tomato deters any large scope for manipulated pricing and hence it is more closely linked to the real-time physical supply constraints.

The above assessment is with the assumptions that farm-gate production is not the core reason for the frequency of fluctuations but that the fluctuations are a reflection of market linkage, market competition, market level organisation and failures therein.

6. Recommendation to alleviate instability:

To alleviate instability in market supply, production and pricing, the key strategy would be to extensively develop a large number of supply chains so as to increase sourcing range into each market, promote competitiveness with efficiency of the supply chain system and -

i. Incentivise to develop a dedicated transport on predetermined schedules via railways or roadways for potato and onion. A favourable transport environment will ensure a timed push of inventory into the city instead of random pull from traders. Additionally, provide incentive for Delhi traders to link up with multiple sourcing mandis via eNAM.

ii. A complementary storage option to be developed to locate buffers of onion and potato close to the markets. These need not be high technology systems but designed to cater to a two week inventory cycle from the buffer into market. The source points can remain the existing farm-gate inventory held at cold stores (potato) or other storage structures (onion).

iii. In case of tomato, the back-end source and reefer transport needs developing to ensure tomato production in other states reaches the city markets safely and in quality. This will require undertaking ongoing development work under mission mode, such that production is assured suitable market linkage. Such development may be targeted through FPOs or rural enterprises focused on agriculture allied businesses.

iv. To alleviate similar demand-supply gaps in other vegetable types, there is need for simultaneous development of modern facilities at the first mile, at rural-gate. It is felt imperative, that to make vegetables marketing feasible, suitable technology in form of modern pack-houses be urgently developed when sourcing from distant areas, as in the case of tomatoes.

v. The SAFAL example also indicates that a structured front end merchandising system helps build better transactional relations with the back-end. Therefore, not unlike the FPO initiative, a Farm Produce Marketing Organisation (FPMO) is recommended under professional management. These can be structured so as to organise the grocery shops, street vendors, etc. into localised demand groups (SHG, or enterprises) which will facilitate the demand-side hub-spoke model of operations.

vi. SAFAL to be provided resources to expand in Delhi NCR and/or to replicate in at least 3 other major cities. Alternately, a dedicated team from SAFAL and spearhead hand-holding and guide similar organisations in other cities.

7. Technology needed in preconditioning, storage, transportation at village level:

In the case of peri-urban clusters, and where the product selling cycle is less than 48 hours (peri-urban supply), aggregation and staging platforms are recommended at village level. The intention is to create nodal points where individual farmers can collect small loads so as to consolidate into viable truck loads. The total load size can be in the range of 2 to 10 tons depending on terrain and distance from urban centre.

These aggregation points should be designed with a covered area for receiving of fresh vegetables and with facility for basic sorting as per quality. Certain volume can be

marketed from these centres for the local market from the same location. Other quantities of suitable quality can be packaged in crates for short term transit to the nearby urban centre to initiate the peri-urban supply line.

Each aggregation point would require CNG supply vehicles of size 2 to 10 tons (a dedicated fleet of 1 or 2 vehicles is recommended). The supply is expected to go to predetermined wholesale buyers or as direct sales to retail points or vendors.

In cases where the source points will involve vegetables that will incur longer than 48 hours selling cycle, it is recommended that pre-cooling systems be attached to the aggregation platforms (modern pack-houses), with onwards transport on reefer trucks. The system standards as listed for MIDH can be used as to guide the infrastructure development.

The technology related to long period handling of perishables will mainly apply to a certain economy of scale at farm-gate – this option is better suited for FPOs that are producing homogenous crop types and undertaking collaborative marketing to achieve such economy of scale at production side.

8. Technology needed in preconditioning, storage, transportation at District (intermediate) level and at City (Wholesale level):

Same as above, directly linked to scale of material handled. In addition, the appending of a small scale food processing unit would be preferred. At District level, it is assumed that sufficient quantity of produce would be culled due to mishandling or market demand, to justify a processing unit (pickling, juicing, jamming, drying, etc.). Food processing units are better established at back-end or first mile handling facilities as the culled items would be edible and not at last stage of their holding life.

It is noted that the SAFAL model does not extend to ownership of the back-end infrastructure, restricting itself to the front-end Distribution Hub and retail outlets. However, the HOPCOMS model extends itself into the back-end by taking ownership of collection centres, transport vehicles and on occasion, mobile vending units. The HOPCOMS model differs from the SAFAL model as it is able to pay higher than the reference mandi prices to farmers. HOPCOMS also provides opportunity for farmers to hold and directly sell to consumers at certain collection centre locations. Besides retailing of fresh whole produce, both SAFAL and HOPCOMS also process and sell products such as juice, frozen peas, etc.

The following tabulates the main infrastructure and equipment requirement-

SN	Description	Explanation (reference vegetables)
1	Aggregation centre	For consolidating produce from individual farms with facility to segregate by quality and prepare for onwards dispatch.
2	Crates or suitable bulk packing	For moving vegetables to receiving hub at wholesale point.
3	Transportation	CNG motored trucks for movement from aggregation point to receiving hub. Additionally, vehicles for last mile distribution.
4	Dump handling	At aggregation point and receiving – so as to divert discards into other related uses.
5	Traceability systems	Record keeping at aggregation point and/or receiving hub to develop farm level traceability.
6	Cleaning/Washing system	At receiving hub to maintain hygiene for returning crates and to prepare vegetables for retail.
7	Receiving Hub	Distribution hub with or without cooling to manage the deconsolidation, preparing and dispatch of retail lots on daily basis. The hub includes grading for retail, especially for produce sourced from peri-urban regions.
8	Precooling and Staging rooms	For highly sensitive crops, or for markets with longer than 48 hours selling cycle. This is recommended after a certain economy of scale is developed at production end (10 to 15 tons dispatch per day).
9	Food processing units	At the bulk collection centre or DC Unit, waste generated due to discards can be processed into juices, jams, pickles. Alternately, dedicated processing for vertically integrated crops can be set up as per local factors.

The size and scale of infrastructure and equipment will be project dependent - directly related to the scale of operations, at production end and at wholesale point. It is to be noted that the SAFAL model is considered successful because of the integration with front-end with retail outlets, which allows to plan for an assured daily off-take of the produce.

9. Technology needed at merchandising level:

At last mile, there are large number organised retailing groups, individual F&V selling outlets including street hawkers. The provision of consolidating demand has been largely ignored, from merchandiser's view point. Individual point of sales is expected to arrange their own procurement from wholesale mandis on a daily basis.

The frequent attention to organised retail, including developing the same through FDI, is expected to organise the selling of harvested fruits and vegetables, by consolidating the daily retail throughput and linking with daily supply. However, organised retailers

use Fruits & Vegetables merely to attract footfall with purpose to market various other items which are deemed more profitable.

There is opportunity in organising the multiple channels that sell agricultural produce, much like how Farmer Producing Organisations is intended to organise production into a scale of logistical viability. Farm Produce Marketing Organisations (FPMO) comprising street vendors and vegetable sellers is a clear learning from the SAFAL model. This can also be done under the umbrella of whole-selling companies who wish to enter the retail side of food business.

The value to consolidating front-end demand is from streamlining throughput into assured demand and fluctuating demand. The assured quantum can then be vertically integrated with peri-urban growers while the variable demand is linked with indirect or mandi based procurement.

10. Infrastructural and Professional management to help farmers receive support on post-harvest supply chain:

Infrastructure support is required for the capital investment as well as in its initial operations. This operational assistance may require considering a form of AMC (Annual Maintenance Contract) that manages a three year PMS (Periodic Maintenance System). After a three year period, the AMC/PMS should be self-sustained by business operations of the operators.

The hiring of professional managers and or mitigating risk of initial period of operations (learning curve in managing infrastructure technology) is not promoted in current government support mechanisms. The main focus is on creation of infrastructure and keeping certain share for PMS/AMC system for an initial 3 or 5 year period may be considered by implementing agencies.

In addition, the ongoing extension activities by the government may be dovetailed to provide knowledge based support where infrastructure is developed. This is especially the case where modern pack-houses are developed as the extension work should assist farmers in the region of the pack-house to produce market linked crops that can be pre-conditioned in such facilities.

11. Measures to identify and promote production clusters (peri-urban) around NCR region:

An assessment or map of Protected Cultivation (PC) and Open-field Cultivation be carried out within a 300 kms radius of NCR. Each cultivator can be tabulated with yield as declared per crop grown in last 3 years. In addition, these can be categorised

on basis of type of assets owned to connect with Delhi-NCR (pack-house, traceability, packaging/crates and vehicles).

The trend of PC development in the region needs to be evaluated since this provides for partial extension of season. However, metric for PC development ought to be linked to the crop production or yield per unit over two or three seasons, and not merely the physical number of PC units created. The Protected Cultivation (PC) units will also benefit from linked development of vegetable seedling units. Appropriate cost norms and system norms are under development by horticulture division.

Consumption volumes in Delhi/NCR - listed for each crop (with possible monthly trends). Evaluation of demand-supply gap done by cross-tabbing assessment of NCR demand with production from the local cultivators. Gap assessment with appropriate cost-benefit analysis (factor competitive advantage of lowered delivery costs due to shorter product selling cycles) as well as opportunity for distant bulk production with associated economy in logistics handling can be propagated.

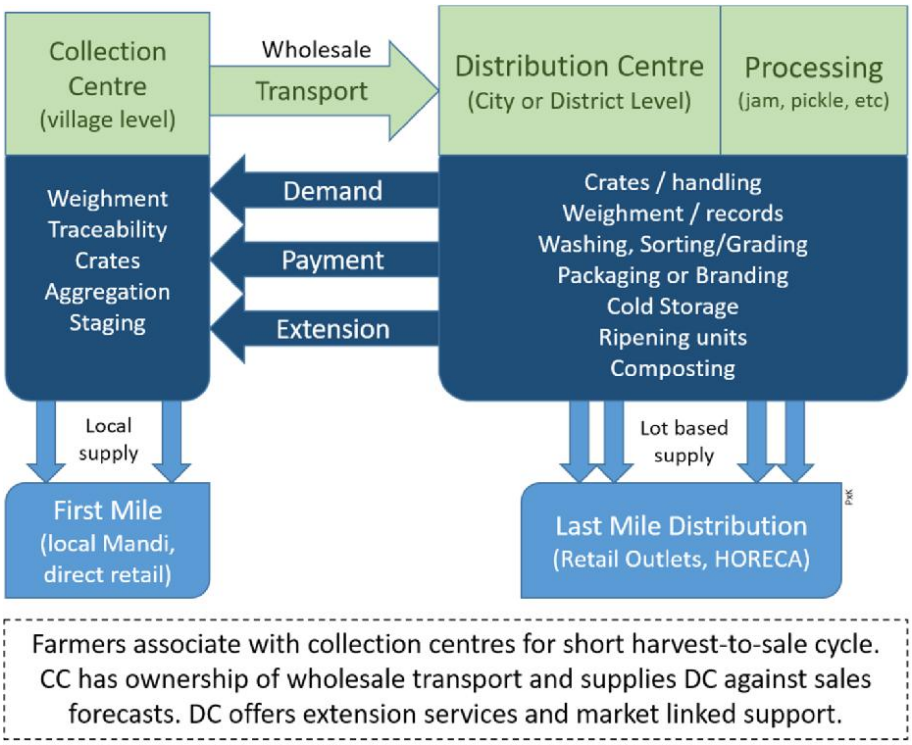
Accordingly, differential support under special support schemes can be developed, to directly link support with volume delivered, stage-wise over a 3 to 5 year period.

It is observed that the Kisan Mandi launched in Sep-2014 in Alipur under aegis of SFAC was not operational to date. Revival of this model will strengthen/support production clusters for vegetable marketing in NCR region.

12. Summary

- The NDDB's fruit and vegetable - SAFAL model - primarily stems from front-end consolidation of demand (from captive retail). This results in arranging a steady-state and assured evacuation from the back-end aggregation points. Any variance in daily demand or supply is offset from local mandi procurement.
- SAFAL is effectively a wholesale point for farmers – the farmers themselves, through collaborative associations take up the onus and costs of aggregation and delivery to the SAFAL receiving hub in Delhi. As part of the relationship with such associations, extension services and negotiation for transport services is managed through SAFAL.
- SAFAL model does not directly infuse technology for post-harvest handling and mainly focuses on procurement from peri-urban sources, with fast connectivity to consumer through its network of owned retail outlets. Cold chain technology will be needed only with volumetric sourcing from outside the peri-urban range.

Typical peri-urban marketing linking operations (SAFAL model)



- To grow such a model, for improved quality of produce, support to farmer associations at back-end in form of short term storage, weighing and traceability systems, vehicles, crates and material handling equipment can be considered.

- To grow this model for larger volumes, support in form of expanding and modernising the retail outlets can be considered. The desired increase in consumer level transactions can be also obtained by linking with street vendors to create a front-end hub-spoke retail system (each existing SAFAL outlet can link and supply multiple street vendors). The revival of Kisan Mandi in Alipur is recommended – this will aid production clusters to access the Delhi market.

- To grow this model, for a larger basket of produce, support in form of direct linkage with FPOs at larger distance from Delhi-NCR is recommended. In this instance, the use of technology for long term handling/storage and marketing is made feasible. The advantage stems from low cost procurement due to economy of scale at the backend. The economy at source justifies buffering at supply side and mechanised handling capacity - cluster based production provides associated scale of allied agriculture business (PHM, Processing, etc.)

Key recommendations:

- Replicate the SAFAL model into other cities and/or expand in Delhi NCR
- Link peri-urban area expansion with crop planning and demand forecast, for-

  - Crops under protected cultivation and open field cultivation
- Implement targeted development of post-harvest infrastructure for this model.
- Run pilots to scale up volume and quality for existing SAFAL network.

13. Any related issues to creating robust & efficient marketing for vegetables:

Other Recommendations:

i. Provide a higher allocation to cold-chain and agrilogistics for agricultural produce (with focus on vegetables and fruit), so as to directly empower farmers/producers with the ability to connect with multiple markets.

ii. Give preference to developing agrilogistics infrastructure for Cooperatives/FPOs and enterprises with prior experience in food production and/or supply.

iii. Reduce subsidy for bulk cold storages and enhance incentives for other supply chain components (Pack-houses, transport, ripening, merchandising systems) which are in greater shortfall.

iv. Provide seasonal rebate to freight (long-haul transport) of key commodities such as onion, tomato and potato to offset seasonal fluctuations.

v. Initiate predetermined container rail routes to promote cross-regional multi-modal trade (greater than 500 kms) of agricultural produce.

vi. Commission a National Policy on Cold-chain & Agrilogistics, to align the various interventions across the country.

vii. The support for area expansion/crop intensification/yield productivity to be directly linked with marketing and agri-logistics development.

14. Operational Model (*Recommended Pilot for Execution*)

The following may be considered by implementing agencies and implemented to test operational models and explore the scope for replication in various regions:

1. Establish an operating team/organisation to develop and execute aggregation centres at district, with Delhi/NCR as the primary target market.
2. Each aggregation centre will be designed in a modular fashion, each module to handle 7 tons per day of fresh produce. Localised scalability will be possible by adding modules of 7 or 15 tons capacity each.
3. Each aggregation centre will implement the following activities:
    a. Serve as collection points for vegetable farmers in a 10 kilometre radius (i.e. each centre will become a fist level hub at the back-end)

b. Serve as pre-conditioning facility for market linkage of fresh produce (i.e. prepare produce for Delhi market and for distant markets per need)

c. Serve as Dispatch centres of retail-ready produce to wholesale markets (i.e. directly connect prepared produce to wholesalers at target market)

d. Serve as procurement centres for wholesalers registered in NAM (i.e. option to assay and place orders for produce at each centre)

e. Serve to give feedback on market demand to attached farmers for quantity and quality requirements (i.e. market linked information).

f. Provide appropriate extension service and other facilitation from state (i.e. facilitation centre for government support or linkage with policies).

Infrastructure of each module (aggregation centre):

i. Each module will be designed as an integrated pack-house (as defined under MIDH operational Guidelines) – receiving shed; manual or assisted sorting/grading/cleaning of local produce; packaging of produce into retail lots; pre-cooling the produce as per market; storing or staging the produce for onward dispatch.

ii. Each module will have captive transport for short distant delivery (into Delhi wholesale) or have owned reefer transport for distant markets.

Each centre will be a nodal point for local farmers, especially small farmers, to aggregate market linked volumes, such that viable transport loads to wholesalers can be initiated. Therefore, the capacity of each module is recommended as 7 tons per day to allow two 4ton vehicular loads to be dispatched to markets. Alternately, smaller loads or multiples thereof can be designed.

Recommended module for aggregation centre

SN	Infrastructure item	Description – main activity
1	Receiving area/shed - 18 m x 9 m approx	Covered shed with a landing platform, 18 m x 9 m approx for off-loading produce from local transport, weighing for records and/or payments.
2	Sorting Grading zone - 20 m x 20 m	Enclosed area with tables or conveyors for sorting the produce into marketable quality and grading for packaging purposes.
3	Cleaning & packaging area – 10 m x 10 m	Washing or brushing (as per need) and packaging the produce for market. This can be manual procedure or mechanised depending on volumes being handled.
4	Pre-cooling unit – 5 ton per batch	Complete package is pre-cooled to provide extend the saleable life of the fresh produce. This may not be required for the dispatch to nearby markets.

5	Cold room (staging) – 30 tons storage	A small cold store, capable of buffering two days output, pending transport variation/availability. Depending on crop types handled, this may require added compartmentalisation.
6	Transport unit	Covered non-refrigerated vehicle for delivery to nearby wholesale markets. Insulated and refrigerated vehicles for distant transport. Unit sizes recommended (4t, 7t, 10t, 15t). Number will depend on road travel time to market.

Market Range and Technology:

The following assumptions are taken:

i. Cluster has small vegetable farmers with Delhi market as target
ii. Cultivators require localised aggregation to facilitate market access
iii. Excess production is not finding market access - surplus is available
iv. There is scope to increase production with improved market linkage
v. Land for aggregation centre is available (approx 1 to 2 acre)

Two key operational models are recommended:

i. Consolidation and streamlining of existing selling cycle into local Delhi market. The operations bring qualitative improvement in supply system and improved delivery fulfilment ratios. There may be no immediate transaction level gains but volumes handled would increase and add to revenue.

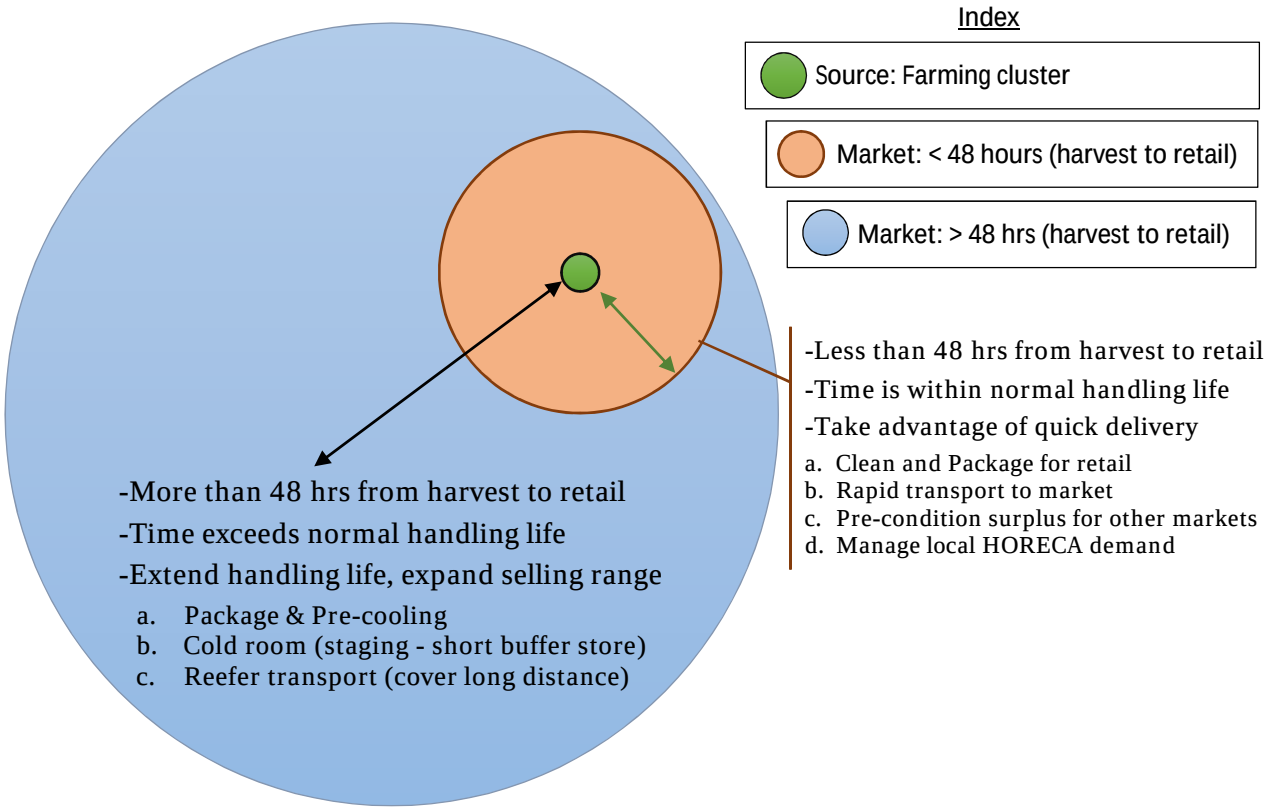
ii. Produce in surplus to existing market linkage would be routed to distant urban centres. A radius of 300 kms is thumb-rule adopted to deploy cold-chain infrastructure to allow perishable produce to travel longer distance. The supply side would be empowered with a logistics bridge and productivity enhancement linked to non-local demand would be promoted.

A modular approach is recommended and operation can be undertaken, starting with at least 3 differentiated source points around Delhi-NCR. The finalisation of the source points may be taken up by the agency to implement and execute the aggregation centres. A wider stakeholder consultation may also be undertaken in due course for involvement of the neighbouring States.

Example (modify to suit locations and crops)**:**

Farming Cluster: Sonipat – Haryana.
Crop targeted: Coloured Capsicum, Cabbage, Green Chillies, Herbs, etc.
Target Market: Delhi-NCR and surplus staged to Kanpur.
Operating Plan: Assuming that 50% of daily collection of 15 tons is sold to Delhi (50 kms) and remaining 50% is sold in Kanpur (500 kms).

For the Delhi assortment of produce, peri-urban farmers would use the aggregation centre to optimise the collection & transport to wholesalers. The intention would be to harvest and reach the market using commercial transport. Where possible, CNG powered vehicles would be preferred to allow bigger delivery window into Delhi.



The produce selected for delivery into distant market (Kanpur in example), would be packaged and precooled for transport in a 7 to 10 ton vehicle. Though Kanpur is 500 kms distance, the vehicle timing through Delhi make the town more than 10 hours travel from Sonipat. This infers that aggregation centre would require at least one reefer vehicle to make the round trip on a daily basis. For cities at a longer distance, the number of vehicles needed will depend on turn-around-cycle of vehicles.

In summation, the operational model will strategically implement a low-technology but fast-tracked supply system to nearby cities (Delhi); and will implement a higher-technology, buffered-supply system to distant cities (> 300 kms).

Organisational Model

To operate these aggregation centres with transport, it is recommended that implementing agencies identify private entrepreneurs to execute the supply chain. On the other hand, keeping in view the success of NDDB in dairy chain, similar government driven interface can also be explored. For this, organisations like the

NHB/NAFED/SFAC, with procurement and experience in developing commercial models can be empowered to operate this model, singularly or by collaborating in a SPV or entity with progressive farmers or existing wholesale aggregators.

However, for purpose of operating a pilot, as recommended by chairperson the establishment of a special cell under a body such as the National Horticulture Board can be explored. The pilot can be supported by giving priority or assured off-take from SAFAL retail to fast-track and spearhead the market linking process. The long term hiring of retail space at various Delhi Haats can also be carried out. Not unlike the NDDB system, the direct involvement of professionals is recommended with a long term mandate.

To closely monitor, guide and facilitate the pilot, there may be need to setup a Steering Committee. This will help to dovetail various existing interventions for market linkage (marketing), infrastructure (MIDH), extension service (ICAR), etc. Successful achievement may be measured by sustained volumetric throughput over a three year period and dissemination of the activity information for replication in other regions.

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Appendix-1

Typical Demand mapping from major cities - for select crops

Urban Cluster	Fruits & Vegetables	Population (2014)	Per-Capita Consumption (monthly kgs)	Monthly Demand (monthly throughput needed in tons)
Delhi	Apple	17421947	0.352	6133
Delhi	Grapes		0.234	4077
Delhi	Orange		0.613	10680
Delhi	Mango		0.449	7822
Delhi	Banana		0.635	11063
Delhi	Okra		0.299	5209
Delhi	Tomato		1.03	17945
Delhi	Cauliflower		0.55	9582
Delhi	Cabbage		0.318	5540
Delhi	Carrot		0.438	7631
Delhi	Potato		1.981	34513
Delhi	Brinjal		0.303	5279
Mumbai	Apple	12600973	0.871	10975
Mumbai	Grapes		0.301	3793
Mumbai	Orange		0.723	9111
Mumbai	Mango		0.752	9476
Mumbai	Banana		0.954	12021
Mumbai	Okra		0.366	4612
Mumbai	Tomato		0.87	10963
Mumbai	Cauliflower		0.394	4965
Mumbai	Cabbage		0.325	4095
Mumbai	Carrot		0.254	3201
Mumbai	Potato		1.122	14138
Mumbai	Brinjal		0.341	4297
Ahmedabad	Apple	6617331.6	0.723	4784
Ahmedabad	Grapes		0.258	1707
Ahmedabad	Orange		0.582	3851
Ahmedabad	Mango		0.55	3640
Ahmedabad	Banana		0.73	4831
Ahmedabad	Okra		0.321	2124
Ahmedabad	Tomato		1.11	7345
Ahmedabad	Cauliflower		0.366	2422
Ahmedabad	Cabbage		0.454	3004
Ahmedabad	Carrot		0.251	1661
Ahmedabad	Potato		2.166	14333
Ahmedabad	Brinjal		0.539	3567
Jaipur	Apple	3827061	0.386	1477
Jaipur	Grapes		0.743	2844

Urban Cluster	Fruits & Vegetables	Population (2014)	Per-Capita Consumption (monthly kgs)	Monthly Demand (monthly throughput needed in tons)
Jaipur	Orange		0.823	3150
Jaipur	Mango		0.849	3249
Jaipur	Banana		0.643	2461
Jaipur	Okra		0.376	1439
Jaipur	Tomato		1.18	4516
Jaipur	Cauliflower		0.431	1649
Jaipur	Cabbage		0.431	1649
Jaipur	Carrot		0.553	2116
Jaipur	Potato		1.95	7463
Jaipur	Brinjal		0.206	788
Bengaluru	Apple	10756171	0.871	9369
Bengaluru	Grapes		0.5	5378
Bengaluru	Orange		0.396	4259
Bengaluru	Mango		1.075	11563
Bengaluru	Banana		1.02	10971
Bengaluru	Okra		0.245	2635
Bengaluru	Tomato		1.12	12047
Bengaluru	Cauliflower		0.272	2926
Bengaluru	Cabbage		0.282	3033
Bengaluru	Carrot		0.352	3786
Bengaluru	Potato		0.533	5733
Bengaluru	Brinjal		0.317	3410
Hyderabad	Apple	15178896	0.37	5616
Hyderabad	Grapes		0.213	3233
Hyderabad	Orange		0.434	6588
Hyderabad	Mango		0.907	13767
Hyderabad	Banana		0.915	13889
Hyderabad	Okra		0.409	6208
Hyderabad	Tomato		1.4	21250
Hyderabad	Cauliflower		0.256	3886
Hyderabad	Cabbage		0.266	4038
Hyderabad	Carrot		0.201	3051
Hyderabad	Potato		0.699	10610
Hyderabad	Brinjal		0.391	5935
Chennai	Apple	4752390	0.536	2547
Chennai	Grapes		0.189	898
Chennai	Orange		0.448	2129
Chennai	Mango		0.928	4410
Chennai	Banana		0.989	4700
Chennai	Okra		0.306	1454
Chennai	Tomato		1.234	5864

Urban Cluster	Fruits & Vegetables	Population (2014)	Per-Capita Consumption (monthly kgs)	Monthly Demand (monthly throughput needed in tons)
Chennai	Cauliflower		0.281	1335
Chennai	Cabbage		0.269	1278
Chennai	Carrot		0.324	1540
Chennai	Potato		0.612	2908
Chennai	Brinjal		0.33	1568
Kolkata	Apple	7875849	0.382	3009
Kolkata	Grapes		0.231	1819
Kolkata	Orange		0.646	5088
Kolkata	Mango		0.781	6151
Kolkata	Banana		0.576	4536
Kolkata	Okra		0.398	3135
Kolkata	Tomato		0.412	3245
Kolkata	Cauliflower		0.689	5426
Kolkata	Cabbage		0.687	5411
Kolkata	Carrot		0.249	1961
Kolkata	Potato		4.15	32685
Kolkata	Brinjal		0.628	4946
Guwahati	Apple	1247917	0.366	457
Guwahati	Grapes		0.365	455
Guwahati	Orange		0.157	196
Guwahati	Mango		0.895	1117
Guwahati	Banana		0.633	790
Guwahati	Okra		0.467	583
Guwahati	Tomato		0.523	653
Guwahati	Cauliflower		0.664	829
Guwahati	Cabbage		0.64	799
Guwahati	Carrot		0.302	377
Guwahati	Potato		2.222	2773
Guwahati	Brinjal		0.506	631

NSSO data extracted from AICIC2015-NCCD

Each cultivar type to be assessed for city-proximate cultivation (open field or protected cultivation). Accordingly, action plan to promote production clusters around target cities would be implemented. Where opportunity arises to promote economy of scale through FPOs, logistics for long haul supply to other demand centres to be developed.

Essentially, if production is suited to match local pockets of demand, the prior aim would be to fast track evacuation into wholesale or retail outlets. If production is in surplus to local demand, preconditioning and long distant connectivity is required.