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National Centre for Cold-chain Development

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Newsletter





The CEO's Desk

Our April edition has received various inputs from our readers, from State governments and from our private industry members.

In this month, NCCD hosted a conclave with the Nodal Officers for Cold-chain Development from multiple States. NCCD was honoured at the attention received. The Principal Secretaries of Meghalaya and Punjab also took time out to attend & guide, all through this day long conclave.

Interactions at this conclave have highlighted the demand for efficient market links, specially in tandem with increased productivity in horticulture, as regions are expected to produce more than own local consumption. Cold-chain technology alone can connect to markets across the sub-continent for commercially viable throughputs.

In our interactions with the Ministry of New and Renewable Energy, we learnt of some innovative hybrid energy based systems, which are deployed in the cold chain. Read more about it in this edition of the newsletter.

Our engineering team has proceeded on a visit to Punjab, to assess options on how best to upgrade the many potato based cold stores there. An estimated 500 facilities need energy biased options with design changes that can prepare them to handle other more sensitive produce. A tall order, but we will learn more soon in coming months.

-Pawanexh Kohli

From the Editorial Team

Shri Ramesh Kumar, our very pro-active member of the Committee on Supply chain and Logistics, is well known for the passion he has toward improving the lot of our road warriors – the truck drivers of India. He has helped NCCD to reach out to these drivers, as part of an awareness drive on refrigerated care on the roads. We hope to commence a regular drive for our drivers soon. This outreach program and an interactive conclave with State Government officers are the two important events that are truly noteworthy in this issue.

This editor received the requirement from two private companies to advertise their technologies in this newsletter. Our CEO has emphatically opined that this NCCD publication primarily concentrate on knowledge sharing and making readers aware of cool happenings.

We also received many promises from prospective Op-Eds, but it seems this particular cold-chain deadline is too hot to meet. We of course, continue to look forward to our readers to contribute innovative views, concepts & knowledge in the form of articles for this newsletter.

Readers are reminded this newsletter is a medium of sharing information and ideas. These are in-house concepts and sourced from other knowledge houses. Due diligence & relevant care must be applied to suit the actual field application, type of product and end use.

-Editor of the month

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OP-ED INVITATION:

Article submissions from readers will be nominated by the editorial team as Op-Ed topics. Readers are invited to write in, articulating their ideas & concepts.



DRIVER AWARENESS PROGRAM

Very often, maybe too often, does one hear that the hardy truck drivers are a bane to cold-chain efficacy. “They switch off the engine”, “they open the door”, “they mess up the controls”, etc, etc. We decided to act on this grouse and reach out to reefer truck drivers. It was time to launch a ड्राइवर जागरूकता अभियान।

Luckily, we had at our side Shri Ramesh Kumar, none other than the man who has adopted the Indian Highways and those who work them! A member of our committee on Supply chain and Logistics, and author of multiple books, he was quick to offer assist. This first interaction of the Drivers Awareness program could happen so readily only with his keen involvement. Having travelled alongside truck drivers for more than 20,000 kms on Indian roads (living in truck cabins), he is well-known amongst truckers and quickly arranged our first such gathering. Our member, MJ Logistics hosted this program at their cold distribution hub in Palwal.

In this first such outreach program, the truckers were made aware of the repercussions of temperature excursions, how these impacted the health and life of the weakest – our children and elders, those unwell and in need of medicine and better nutrition. More than 35 drivers were addressed and a session on safe driving and learning of road safety signs was included.

The drivers were highly interactive and expressed appreciation for the opportunity to learn and understand. Many showed a high level of awareness but also shared that with this interaction, they now realised a far greater responsibility. They suggested that such information also be shared with their “maaliks”, the transport owners and managers. This was not mentioned in jest... they sincerely felt that not many fully understood all that was at stake. The need to share such information, as well as some technical skills may also help develop more responsible reefer drivers for the trade.



This meeting made it aptly clear to us that knowledge empowers. We hope that with the participation of more cold stores and transporters, and Mr. Kumar's active involvement, NCCD shall be able to develop this into a regular outreach event.

COLD-CHAIN INSIGHTS

- II

Pawanexh Kohli

Essentially, the cold-chain is tasked with two underlying functions - to “**Preserve and Protect**” and to “**Extend and Connect**”. Let us explore these two distinctions and by understanding them, the approach to cold-chain development may merit certain changes.

First, let us clearly differentiate the type of products that benefit from the cold-chain. In further simplifying, we can consider two extremes from a choice of product types – ice cream and fresh mangoes. The first symbolises the frozen < -18 °C) segment and the other is from the mild chill (10-20 °C) segment. In case of ice cream, the cold-chain functions to preserve the product, and in the case of mangoes the cold-chain serves to extend its normally short saleable life.

Ice-cream enumerates the cases where the product cannot last without the cold-chain. Without cold-chain technology to protect from inclement natural or ambient conditions, there is no ice-cream. The cold-chain here has a preservative effect on the cargo or goods it protects – there is no extension of storage life, only that of preserving its existing state. In other product types the cold-chain either preserves the physical shape or protects from direct external degradation like meats, most processed foods, vaccines, many chemicals and plastics, electronic goods, etc. Without the cold-chain, these products will rapidly decompose or decay, deform or lose their usable form or quality. Most such products, have undergone a production or manufacturing process and have a predetermined price assigned. The package expire-by-date or use-by-date is also predetermined and is maintained by subjecting it to predefined temperature parameters; the product quality and security and hence price, is safeguarded by the cold-chain to great accuracy.

Here, a production unit or factory is usually the origin of the cold-chain, from the making of product to market. Quality & value is created at point of origin and that value is preserved for market realisation by cold-chain services.

On the other hand, in case of mangoes, they have a natural saleable shelf life even without the cold-chain, and the cold chain is used to Extend the produce’s life cycle, buying more time to transact the sale. This same applies to fruits and vegetables in fresh form (primarily living perishables). Within the cold-chain, though the produce’s life cycle is extended, the produce continues on a perpetual, albeit retarded, downward biological life cycle.

In such cases, the goods are normally harvested produce and do not undergo any process akin to manufacturing and have no marked “expire by date” or fixed pricing. Cold-chain is not used only to temporarily extend the saleable life (expiry), but also safeguards degrading of its nutrient quality and allows to connect to markets much before this extended life is overdue. The time extension is utilised to connect with markets for better price realisation.

Here, farm-gate pack-house is the origin of the cold-chain. Quality is as harvested, but value is determined at point of sale. Cold-chain in such cases, should not procrastinate the selling transaction but extend and hasten the farm to fork selling cycle.

Multiple variations of these two distinct benefits will be evidenced in strategies applied in commercial models. These two benefits overlap and correlate across some product categories.

FRESH PRODUCE GOSSIP

- ❖ The banana is a berry, the strawberry not.
- ❖ Apples float in water as they are 25% air.
- ❖ An average strawberry has 200 seeds.
- ❖ Pumpkin is a fruit, not a vegetable.
- ❖ According to the Dead Sea scrolls, cherry seeds have satanic power.
- ❖ Kiwi has twice as much Vitamin C as orange.
- ❖ In the 19th century, sailors ate lime to avoid scurvy on long sea trips.
- ❖ Unlike mango, grapes can no longer ripen after they are picked.
- ❖ Watermelons were used by explorers as means to carry water on long expeditions.
- ❖ You can speed up ripening of a pineapple by standing it on its head (leafy end).
- ❖ Strawberry and cashew are the only fruits to have their seeds on the outside unlike all others which have their seeds inside.
- ❖ Avocados are toxic to almost all animals (including cats and dogs). Humans are a rare exception.





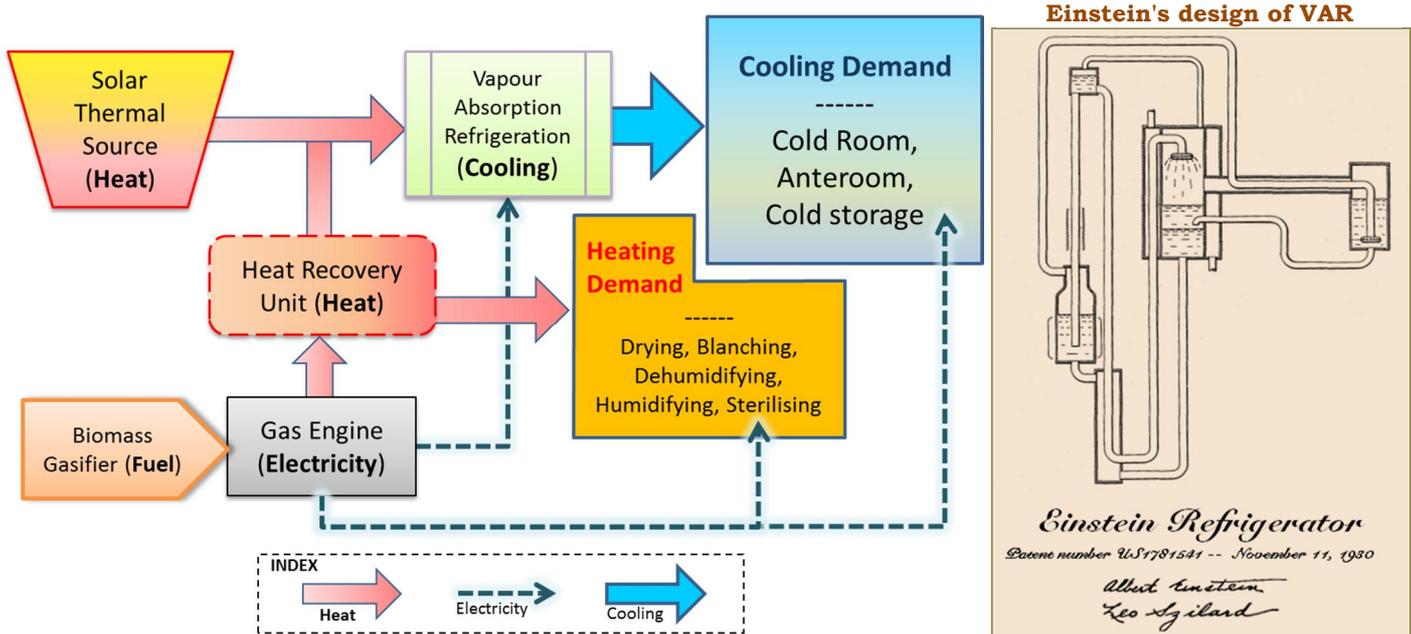
ALTERNATES IN ENERGY

Pawanexh Kohli

Cogeneration of Power and Cooling - *Solar Thermal and Bio-mass*

Today, the common refrigerator uses Vapour Compression Refrigeration (VCR) technology. This means using mechanical energy to physically compress a gas (the refrigerant) that is later subject to evaporation / expansion to create the cooling effect. An alternate technology is **Vapour Absorption Refrigeration (VAR)**, which uses heat energy to create the necessary cooling cycle.

As heat is available in plentiful in the modern world, VAR technology has fascinated scientists and innovators. Even Einstein refined and patented a refrigerator design based on VAR.



VAR were actually the common form of domestic refrigeration until the advent of VCR or compressors. This change from VAR to VCR happened because the coefficient of performance from mechanical compression based refrigeration is higher than that of absorption based refrigeration. Yet, with cost of energy rising and increased focus on solar thermal and environmentally friendly applications, the total value derived from VAR based refrigeration is now an attractive proposition. The total energy cost of operating such a technology is minimal, specially if solar thermal energy is captured to drive the machine and additional wasted heat energy is tapped from other utilities. No mechanical compressors are needed, which means ultra-silent units with low maintenance needs.

The VAR system can use ammonia as the refrigerant and water as an absorber. Designs where water serves as the refrigerant medium and hygroscopic salt as an absorber are also an option. At one side, the absorber readily dissolves or absorbs the refrigerant creating a partial pressure drop in the closed cycle, and the refrigerant is then released back by heating the absorber (this is where heat energy is applied). The system creates an effective flow of the refrigerant for the cooling cycle. A small system can even operate on kerosene as fuel or kept over a campfire to create refrigeration. Of course, the trick is to minimize need of any fuel and to use other heat sources.

Nowadays, the vapor absorption cycle is used where waste heat is available and where heat can be harnessed from incident solar radiation (insolation). Absorption systems are a great alternate to regular compressor based units where electricity is unreliable or unavailable, or where surplus heat is available (e.g., from turbines, industrial processes, bio-gas fuelled generators, other solar plants, etc).

Do you know - DLF Cybercity (Gurgaon) meets all its cooling needs without electric energy, from two Vapour Absorption Refrigeration Plants of 18,700 TR (tons of refrigeration) each, driven only by the hot exhaust from their other utilities generators. In India, cold stores of upto 5000 ton capacity are successfully using various renewable energy solutions. [1 TR = 12000 BTU/hr = 3.52 kW]

NCCD-NOCCD CONCLAVE

On 9-May-2014, senior officers from 19 State Governments and from 3 Ministries gathered in Delhi to brainstorm on various development matters related to cold-chain. The conclave was organised in-house by team NCCD and was held at IIC Annexe (Lodi Road, New Delhi).

The conclave was part of ongoing institutional capacity building in cold chain. The agenda for the event was to discuss the new Mission for Integrated Development of Horticulture (MIDH) Operational Guidelines basis which State Horticulture Missions & Departments and the National Horticulture Board were to drive future cold-chain development in the country. The gathered members were provided a draft document which detailed some of the cold-chain components for discussions. The concept behind introduction of new components and the revisions made were presented and discussed with the attending officers.

Earlier each State had been requested to nominate Nodal Officers for Cold-chain Development (NOCCD), and this was the first group interaction between NCCD and the NOCCDs. A few of these officers had already undergone the 3 day course developed by NCCD, with live demo units at the Learning Centre by Danfoss in Chennai. At this conclave, a demand for more such trainings was extended, with the inclusion of other allied departments. There was unanimous understanding from each participating State that cold-chain development was key to sustained productivity across multiple agriculture types and to empower small farmers of India.



While each region was at differing levels of development and had varying needs, the demand for greater knowledge based support was a collective expression. This would seem to infer that the “cold-chain” is migrating from sole need of basic financial support, towards demands that are also related to better practises, targeted technologies and operational excellence.



A presentation was made to share recent initiatives of the Ministry of Food Processing Industries by Mr. Pankaj Kumar (Director). This presentation provided insights into allied areas of cold-chain as necessary for the food processing sector. Dr. G.H.V. Ratna Babu shared NABARD's funding options and the bottlenecks thereof. It was also shared that a unified approach to support cold-chain would be coordinated. It was noted that many of the States addressed various segments of the cold-chain, for fresh produce & processed products under a common umbrella.

Key information on energy sources was shared by Director (Energy Access & Solar Thermal), Ms. Veena Sinha of the Ministry of New & Renewable Energy (MNRE). Her session at the



conclave was received with immense interest and this interface is the first of many, which will lead to more sustainable and environmentally friendly development of the cold-chain.



Direction to fast track knowledge based support to entrepreneurs was a topic of critical discussion. It was decided that special teams for cold-chain be set up in the States. These teams would be tasked with the responsibility for greater collaboration & coordination with the Centre and with other Departments in their States. These teams would undergo conceptual and technical capacity building with NCCD, so as to additionally prepare them to assist with appraisal of project proposals and monitoring at State level. This would also help speed up the process of providing support as well as knowledge sharing with the stakeholders. On this occasion, Punjab announced that they had already initiated the establishing of a technical team on cold-chain.



Cold-chain development required cross-functional and cross-domain support. There arose the need to involve other development programs such as those for vocational education, food safety and health, energy, transport, technology, industry & agri-sciences. There was low confidence in the prevailing knowledge base in various States, especially on designing, equipment selection and holistic application in cold-chain, while at operational level skills are seen to be improving. NCCD technical team was requested to visit States to advise on technology up-gradation options.



There was no dispute on the growing market demand or synergistic impact on productivity. It was reported that there are many takers for this trade and a strong need expressed for platforms with cross domain knowledge sharing - improved guidance was the need of the hour.

See the complete report on this conclave on the NCCD Website.



NCCD GLOSSARY OF COLD-CHAIN

Our CEO, Mr. Pawanexh Kohli, frequently tells us not to read the cold chain as two separate nouns but as a merging of concepts. He tells us that the Cold-chain is not just about the "cold" but that it refers to all logistical process applied, to maintain multiple parameters, during the pre-conditioning, handling, transport, storage and retail of products. The cold-chain (he insists we hyphenate the words to perceive the compounded concept), includes varied aspects of packaging, atmospheric gases, biology, injury, humidity, traceability, infrastructure, people & product flow, besides temperature. In fact, temperature control can only work with all others in synch.

Sorting: the activity at source when produce is assorted into target lots basis qualitative criteria – as non-edible, as reject or dump, by quality, by shelf life, by market value, etc. This sorting activity is the first step that brings the concept of value to fore. Essentially, this is the first stage categorisation of received produce and separates them into differentiated value-based flow towards an ascertained and useful end-use.

For example, the 'late harvest' assortment would need a quick sale and head readily to a local market... the 'early harvest' assortment may target consumers at distant markets... the 'just turning' banana should bypass the ripening chamber, straight to consumer... the non-edible reject would divert to a vermicomposting unit, or dye making... trimmings be sorted for cattle feed... the surplus for food processing, etc, etc. All are different value realisation channels, all are aimed at optimising the off-take at production point.

When practised correctly, the process of sorting is the original step towards maximising value extraction of harvested produce. The assorting of produce into target use based destinations, the farmers can, be paid or, realise the most value for their fresh harvest. Sorting can even be controlled at harvest level – example, in case of roses the flower is harvested early in budding phase so as to sell in distant markets, but harvested late in full bloom when the target market is next door. Sorted product is assigned or classed into value based flow for an end use.

Grading: this is often erred to be synonymous with sorting, largely because the earlier sorted produce is colloquially termed into A-Grade, B-Grade, C-Grade (these are actually quality based terms). In actuality, Grading is a pre-cursor to packaging, performed such that the unit package dimension stores the maximum. To explain, similar sizes and shapes fit more securely into a package, but mixed sizes and shapes when packed together are likely to lead to inefficient space utilisation and even damage when handled. If you fit a football, a basketball, a cricket ball, a table tennis ball into a box, you end up wasting space; but if all are of one size, the space is efficiently used and the fitment is snug. Graded product makes marketing easy.

Grading originated more as a logistics necessity, and involves the physical segregation of goods into optimal packing lots, after initial sorting. Grading is good practise for packaging and markets now demand graded produce for efficient shelf space utilisation & for graded shelf presentation.

While the **Cold-chain** should not to be inferred simply as a 'chain of activities in the cold', as may be construed from an ingenuous joining of two distinct meanings, on the other hand **Sorting** and **Grading** are not one but two separate activities that serve two conspicuous & distinct purposes.

The process of Sorting is to direct flow of collected goods into existing and multiple value based uses and the process of Grading is subsequently to physically prepare the sorted goods for better handling, transport and marketing. Certain assortments do not need consequent grading, whereas all high value 'A-category' goods will typically undergo grading and then packaging so as to safely reach end destination. There are of course many atypical uses of both activities.

EU bans Alphonso & four Veggies from India (May-2014)

Citing presence of non-European fruit flies in 207 shipments last year, EU has banned import of Alphonso mangoes, snake gourd, bitter gourd, taro plant & eggplant from India. This is effective 1-May-2014, planned for revision before Dec-2015. Pest risk to EU salad industry was stated.

NID student designs cooler for vaccines (May-2014)

A graduate of National Institute of Design (NID), Ashutosh Biltharia, has developed a portable vaccine cooler for last mile connectivity in the cold chain. The project is funded by the design clinic scheme of the Union Ministry of Micro, Small and Medium Enterprises (MSME).



MANGO SEASON



Some factoids about Mangoes

Mango Respiration rate; ethylene production:

- ❖ @ 10°C: 12-16ml CO²/kg·hr; 0.1-0.5 ul C₂H₄/kg·hr
- ❖ @ 13°C: 25-22ml CO²/kg·hr; 0.2-1.0 ul C₂H₄/kg·hr
- ❖ @ 15°C: 19-28ml CO²/kg·hr; 0.3-4.0 ul C₂H₄/kg·hr
- ❖ @ 20°C: 35-80ml CO²/kg·hr; 0.5-8.0 ul C₂H₄/kg·hr

At optimal temperatures, physiological processes reduce drastically and less fresh air ventilation is needed. Between 20°C and 13°C, the respiration rate reduces by 1.5 to 3.5 times, depending on cultivar.

Respiration rate is also a measure of heat produced. Ten tons of mangoes (a truck load) at 20°C can produce 97,600 kilo calories per day (this is equivalent to 3,52,000 BTU of heat in a day)

Mangoes are normally moved from farm when at mature green stage. Mature green mango suffers chill injury at 10°C, & sustained exposure below this temperature does not result in good ripened quality. Hence mangoes should be kept at slightly higher temperatures (12°C to 14°C). Ready to eat, ripened mangoes can be stored for several days at temperatures as low as 7°C. In case of mango purees, a storage life of up to 1 year or longer could be expected at -18°C or lower.

Mango Water Content:

- ❖ 85-90% water, Specific heat ~3.7 (kJ/kg/°C).

When handling mangoes, a humidity level equal to or higher than its water content prevents shrinkage and loss of freshness. A relative humidity of 95% is recommended.

Stowage factor:

- ❖ 2.27-2.55 m³/t (fruit crates) and 2.26-2.83 m³/t (cartons)

Helps decide optimal box types for transport and storage logistics.

Mango Handling:

- ❖ Ethylene – comparatively Low Producer, Ethylene sensitivity – High. Do not store with other high ethylene producing foods.
- ❖ Post-harvest treatment: Desapping is done to avoid latex injuries (sap burn) to skin. Hot water treatment: 30-90 minutes (depending on fruit size, grade the fruit first) dip in 50°C ± 2°C water. Fungicide treatment alone or in combination with hot water treatment can also be done, depending on destination market.
- ❖ Precool the packaged produce to 12-13°C before commencing transport leg to market.
- ❖ CA conditions can further delay reduce respiration and ethylene production.
- ❖ Post-harvest life potential at 13°C, 2-4 weeks in air and 3-6 weeks in CA conditions, depending on cultivar and maturity. It may be interesting if CA conditions would kill fruit fly eggs and larvae.
- ❖ Ensure careful packaging and handling to minimize mechanical injuries.
- ❖ Exposure to 100-ppm ethylene for 12 to 24 hours at 20 to 22°C and 90-95% relative humidity results in accelerated and uniform ripening of mangoes within 5-9 days, depending on cultivar and maturity stage.
- ❖ CO₂ concentration should be kept below 1% in the ripening room.

Mango Optimal Conditions:

- ❖ Keep mature-green mangoes at 13°C.
- ❖ Partially-ripe and ripe mangoes can be stored at 10°C.
- ❖ Maintaining 90 – 95% RH helps fruit to last from 10 to 14 days.
- ❖ Sensitive to contamination by fats and oils, protect from contamination.
- ❖ Keep segregated from ethylene producing crops to avoid early ripening.

“Wishing you a delicious Mango season”



List of NOCCD

Nodal Officers for Cold-chain Development (NOCCD): to coordinate development initiatives and redress concerns in liaison with NCCD. The following is the current list of NOCCDs as nominated by the State Governments. This list will be regularly updated on our website as more States are included.

#	Name	Designation	Department	State
1	Mr. Sita Ram Jat	Joint Director	State Horticulture Mission	Rajasthan
2	Mr. K. M. P. Murthy	Joint Director Horticulture	State Horticulture Mission	Karnataka
3	Mr. Tage Tatung	Managing Director	APHPM&PB	Arunachal Pradesh
4	Mr. Krishan G.Malik	Horticulture Development Offr	State Horticulture Mission	Punjab
5	Mr. Neeraj Saha	Assistant Director DOH	State Horticulture Mission	Chhattisgarh
6	Mr. K. Sarmah	Sr Agriculture Development Offr	Drte off Horticulture & FP	Assam
7	Mr. C.M.Patel	Deputy Director	State Horticulture Mission	Guajrat
8	Mr. L V. Ram Reddy	Executive Director	State Horticulture Mission	Andhara Pradesh
9	Dr. S K Chauhan	Director	State Horticulture Mission	Uttar Pradesh
10	Dr. Prabhakar Singh	Deputy Director	Directorate Of Horticulture	Jharkhand
11	Dr. Kuldeep Singh	Director	State Horticulture Mission	Haryana
12	Mr. N H Kolapkar	Deputy Director	Directorate Of Horticulture	Maharashtra
13	Mr. Melvin Jose	Technical officer	State Horticulture Mission	Kerala
14	Mr. Saif Din Ganie	District Horticulture Officer	Directorate Of Horticulture	Jammu & Kashmir
15	Mr. Triru.G. Kandasamy	Joint Director Horticulture	TANHODA, DOH	Tamil Nadu
16	Mr. B.K.Hota	Assistant Refrigeration Engr	Directorate Of Horticulture	Orrisa
17	Dr. Piyush Pramanik	Deputy Director	Directorate Of Horticulture	West Bengal

These Nodal Officers shall coordinate queries from their States with NCCD, organise outreach programs and inputs from various stakeholders. Inputs from each State will lead to formulating appropriate interventions for each region. NOCCDs will undergo trainings & workshops by NCCD.

FRUIT FLYS

There are reported 325 species of fruit flies occurring in the Indian subcontinent, of which about 205 are from India alone. The one that favours mango is called *Bactrocera dorsalis*. Mango is a part of the fly's reproductive cycle. The young mango fruit, as it nears maturity, is an attractive host for the larvae. The female fruit flies implants eggs in the fruit and the larvae grow within. If not managed, at the consumption end, the larvae can emerge as an adult, mate and proliferate their species. Fruit flies can also infest eggplant, tomatoes,

Various preventative & corrective measures are possible to avoid this concern.

IIHR recommends that in case of mango, the following eco-friendly precautions be taken, 45 days before harvest-

- ◆ Destroy all fallen fruits at weekly intervals
- ◆ Install methyl eugenol plywood fly traps, at least six per acre.
- ◆ Plough the soil at the tree base at frequent intervals.
- ◆ Three weeks before harvest, spray decamethrin 2.8 EC @ 0.5 ml/l + Azadirachtin (0.3%) 2 ml/l.
- ◆ If fly infestation is serious (>5/Surveillance trap), spray bait on the tree trunks at weekly interval (*Bait spray is prepared by mixing 100g of jaggery in one litre of water to which 2 mL of deltamethrin (2.8 EC) is added*).
- ◆ The harvested fruits may be treated with hot water for 1 hour at 48°C.



It is important that post-harvest management involves hot water treatment to destroy the eggs in the fruit. Luckily, during sorting, most fruits with larval feeding are naturally culled because that fruit is soft and yellows early. This is because the larvae bores into the flesh of the fruit. This also causes secondary infection and headaches to post-harvest managers. Hot water treatment is effective in destroying the oviposited eggs / larvae within the fruit.

Mango is not too tolerant to heat treatment and the duration of the treatment depends on size of fruit, therefore the fruit should be graded into lots before heat treatment or hot water treatment is done. Alternative treatments to hot water are Hot vapour Treatment, Forced hot air, High temp CA, Irradiation, etc. After heat treatment, the fruit must be immediately hydro-cooled before packaging and to prepare for remaining activities on their journey to market.



LUMINARY SPEAK



Shri Saumitra Chaudhuri, Member Planning Commission

Cold storages are a component of the total cold-chain; in a way they serve as a jumping board for the flow of produce to markets. Despite having a healthy capacity in cold storages, very few cold-chains abound – your opinion on the state of cold-chains in India?

Cold stores are the heart of the required infrastructure of cold chains; it is the vital hub of the cold-chain around which myriad other activities – from handling, transportation, inspection and packaging – add up to complete the cold-chain system. It serves a wide range of end needs, historically prevalent in potatoes and spices, and increasingly extending to fruits and marine products. Cold stores are the process of choice for temperature-controlled handling of agricultural produce. It is time that our cold-chain business expand across a much wider range of perishable farm produce in order to constructively respond to the evolving needs of the Indian consumer.

Perishable produce should be subject to the least possible touch points in the supply chain. Yet, our domestic transactions perform undergo multiple handling; anathema to cold-chain. Can this be minimised?

There are two classes of problems here. One is the institutional character of the way farm produce enter the supply chain where statutory provisions which have long outlived their usefulness – namely the APMC – intervene in the interface between cold-chains and the grower. Second, is the development of the cold-chain per se, where the desired end state should be that the product interchange between the farmer and the consumer involves least handling. Ideally storages should be available in growing centres from where they are despatched to the consuming centres depending on market demand. However, the two classes of problems are inter-related and we must find a way to resolve this satisfactorily to serve the interest of the farmer, consumer and overall system efficiency.

Cold chains are most beneficial when they function to cover distances to open direct trade with more markets. Do you think inter-state partnership in developing cold-chain networks is possible?

Inter-State transactions are a vital piece in the building of a national market for fresh farm produce. It widens and deepens the market, increases opportunities and stabilizes prices. We must make every effort to strengthen inter-State flow of fresh farm produce in which the development of the cold-chain infrastructure including handling, storage and transportation are vital ingredients. The NCCD has a very important role in all of this and I would like to see this happen in the years to come.

In May 2012, you had headed the committee that assessed supply chain requirements for agri-produce over the XII Plan period. How do you see progress on the recommendations put forth in that report?

Stakeholder ministries have improved and deepened their support systems to align with the recommendations of the Committee. However, the institutional change that was recommended especially removing perishable farm produce – in particular fruits & vegetables – from the compulsory list of APMCs has yet to transpire. It is however heartening that private investment in cold chains has picked up strongly and government assistance under various schemes has also picked up momentum.



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Op-Ed of the month



NCCD is an autonomous body set up by the Government of India with the aim 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 government agencies.