Identification of Benchmarks for Adoption by SMEs in the Indian Cold Chain

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The potential of cold chain industry in India has remained untouched. Major challenges faced include high initial investment (despite government subsidy), country specific regulations and taxes, adequate infrastructure, awareness for managing perishable produce, etc. In India, the trend is now shifting towards establishing of cold storages for multipurpose and providing end-to-end services to control. This research demonstrates the future of cold chain storage in India. This empirical research shall examine and focus on the crucial role of cold chain storage in reducing the agricultural losses.

Keywords: Cold Chain, SMEs, Benchmarking, Refrigerated Trucks, Farm to Folk, India

1. Introduction

In India, Cold Chain Industry is developing at a faster pace because the focus has tremendously shifted from increasing the production to make storage facilities and transportation better. The cold chain has now become an integral part of the supply chain industry comprising of refrigerated storage and refrigerated transportation. The cold storage facilities have the ability to maintain the shelf life of perishable goods by maintaining suitable temperature of the products from the farm to folk. Owing to the rising needs of the cold storage for reducing the wastage, this industry is anticipated to grow at a CAGR of 19% during 2017-2022.

The cold chain storage industry in India is still at a growing stage and despite production of perishables at a large scale; the major challenges include high initial investment (despite government subsidy), lack of supporting infrastructure, lack of knowledge for managing perishable produce, etc. Also, increasing urbanization and growing of organized retail, food servicing and food processing sectors are helping in boosting the growth of cold chain industry in India. The trend is now shifting towards establishing of cold storages for multipurpose and providing end-to-end services to control parameters throughout the value chain. The research seeks to demonstrate the future of cold chain storage in India. This empirical research shall examine and focus on the crucial role of cold chain storage in reducing the agricultural losses.

We shall initially carry out a critical literature review in the field of supply chains management for cold chain in India. This will help understand the current practices and relevant characteristics applicable to SMEs in this sector. Next, through an empirical study, survey SMEs to identify gaps and finally suggest bench-marking parameters, such as, renewable energy, innovative technologies, etc., for future development of cold-chain infrastructure.

2. Literature Review

Supply chain of perishables things is a "cold chain" (Bishara, 2006). A cold chain ensures wide assortment of food, medicines and substance items from debasement and prevent them from inadequate exposure to the temperature, dampness, or specific items by keeping them chilled, frozen and fresh. As Indian economy depends on horticulture, improvement of cold chain outline will assume an important part in reducing the troubles and wastage's, increasing the farmers income, creating work open doors for the neighbourhood individuals, and enhancing the occupation of the farmers and agriculturists to prompt building up the Indian economy and becoming a worldwide pioneer (Negi and Anand, 2015).

Cold storage plays vital role in reducing post-harvest losses of edible commodities by enhancing their storability and shelf-life. Timely storage of highly perishable and perishable commodities helps in their regular and continuous supply either for table or processing purposes. Food supply chains are defied with expanded shopper requests on sustenance quality and manageability. While updating these chains, the examination of nourishment quality change and natural heap of new situations is as imperative as the investigation of effectiveness and responsiveness prerequisites (van der Vorst et al., 2009).
The equipment and process used to convey and keep chilled and frozen sustenance's in the correct shape and quality in place is known as the "cold chain". The cold chain is a physical procedure that commands the coordination's of certain handled nourishments. Temperature prerequisites shift among sustenance things, regardless of whether frozen or chilled, and they significantly vary over various types of solidified nourishments.

Simchi-Levi, Kaminsky, and Simchi-Levi (2004) defines SCM as "an arrangement of methodologies used to proficiently incorporate providers, makers, stockrooms and stores, with the goal that stock is created and conveyed in the correct amounts to the correct areas and at the perfect time, to limit framework wide expenses while fulfilling administration level necessities". A key component of the present business condition is the possibility that supply-chains and not organizations contend (Christopher, 1992). Managing supply chains effectively is a complicated and challenging task as a result of the ongoing trends of expanding product variety, short product life cycles, increased outsourcing, globalization of businesses and continuous advances in information technology (Lee, 2002).

Any mix-up in time-separation or temperature in the chain can easily hinder the net present estimation of the exercises and their additional incentive exposed to the harsh elements in chain (Bogataj, Bogataj and Vodopivec, 2005). In the supply chain of non-perishable items and the supply chain of perishable items there is basic difference as the perishable items has the possibility of degradation in quality and estimation of the thing, which begins from the maker's place till it, is devoured. The cold chain begins at the homestead level (e.g. methods of harvesting, pre-cooling) and conceals to the purchaser level (cooling practices and conduct). An average cold chain foundation for the most part comprises of pre-cooling, chilly stockpiles, reefer trucks, bundling, distribution centers, retailers, and shoppers, under the aegis of data administration frameworks (Montanari, 2008).

The integrity the cold chain must be safeguarded from producing to processing and through every logistical stage – taking care of, stacking, unpacking, and storing and it also covers storage at the any household also i.e. refrigerator. Salin and Nayga (2003), advocate that an effective and efficient supervision of cold storage is a way to avoid pointless misfortunes. Literature works on management of cold chain have talked about different methods of performance variables and aspects that impact the cold chain's proficiency and reliability. Donk, Akkerman and Vaart (2008) has investigated the exact issues of producers who are searching for efficient cold chain and it has been recommended that sustenance supply chains are in the bleeding edge concerning inventory network works on, organizing of the chain and furthermore utilizing of the ideas like Electronic Data Interchange, Vendor Managed Inventories and Collaborative Forecasting & Replenishment techniques..

Fearne and Hughes (2000) examined the advancements of production network in the UK perishables industry and have identified achievement factors, such as change in the cost control and development, etc. Bogataj et al. (2005) and Valeeva et al., (2006) have studied the steadiness of perishable items in the logistical chains at the farm level. In this regard, Jahre and Hatteland (2004), Blanco, Masini, Petracci, and Bandoni (2005) and Berger (2007) all have focused on the standardizing of the packaging and distribution of perishable items. Government, non-government, industry, the educational institutes and the communities should work intently to make the entirety of cold chain from "*farm-to-fork*".

Researchers, such as Sahin, Babaı, Yves and Renaud (2007), Blanco et al., (2005), Mangina and Vlachos (2005), Jahre and Hatteland (2004), jointly talk about the multiple challenges the cold chain is getting confronted from either the producer, or the processor, or the distributor or the retailer. Their perceptions are that the cold chain is broken at a few places in the connecting link which eventually decreases its execution. In this regard, Fearne and Hughes (2000), has said that the supply chain advances in the perishable industry of UK and has recognized a few achievement factors like change in the cost control and development, etc. Bogataj et al. (2005) have considered the solidness of fresh produce in supply chain and examined the unsettling influences which diminish the cleanliness and nature of produces. For perishables, keeping up the cleanliness, security, and expectedness of value and freshness requires proficient hardware with ensured warm attributes, fitting working modes and appropriate data framework (Amjadi, 2005; Manning, Baines, and Chadd, 2006). Montanari (2008) had identified the basic constraints influencing sustenance superiority and wellbeing and measurement through an orderly demonstrating methodology will permit checking the quality and security status of nourishment items all through the cold chain.

Chan, Chan, Lau, and Ip (2006) stresses that keeping in mind the end goal to enhance execution of the whole cold chain it is needed to investigate the factors form which the execution of item, administrations and processes can be assessed. Productivity is the conventional execution factor and all cold chain members might want to get a worthy profit for their speculations in the wake of barring different expenses (Da Silva and Filho, 2007). For the agricultural food chains, both making and value dependability influence sustenance security. In this manner, the capacity to give enough items to ensure a sufficient supply to address sustenance issues is additionally a critical execution (Manning et al., 2006; Da Silva and Filho, 2007). There is need to answer suitable performance factors whether the customers receiving the cold storage items are adequate quantity, good quality, timeliness and prices (Fearne, Barrow and Schulenberg, 2006; Beamon, 1999).

The traceability issues were taken by numerous analysts (Kelepouris, Pramatari, and Doukidis, 2007; Regattieri, Gamberi, and Manzini, 2007; Folinas, Manikas, and Manos, 2006; Joshi, Ban wet and Shankar, (2009) and they all have expressed the need for solid IT framework for cold chains. In supplement to this, Rijswijk and Frewer (2008) explored that traceability is connected to nourishment wellbeing as well as to the nature of sustenance. Taylor and Fearne (2006) have watched that most vital test in cold chain administration is steady unevenness amongst free market activity which is bolstered by Gorton, Dumitrashko, and White (2006) while discussing the issues vanquishing the stock system frustration in agri-nourishment division. At retail level keeping up the cold chain, stock control and return or trade approaches of perishable things are a few issues which have been suggested in the writing.

Luo, Zhu, Ye, Hou, Chen and Bulysheva (2016), talks about the future of cold storage where the structure and information platform design mechanism are introduced. The key part of this system is a wireless sensor network built on Zigbee. Wireless sensors located in cold storages or refrigerated trucks are able to collect and transmit live data quickly and efficiently.

As we know that India is the world’s largest milk producer but none of Indian dairy is listed in top dairy companies of the world (Banerjee, 2007; Brouwers, 2006). Also estimates that around 35-40 percent of the aggregate generation of new foods grown from the ground is wasted in India which is equivalent to the aggregate creation of the Great Britain (Khan, 2005). At the present level of creation cultivate deliver of about Rs 70,000 million (US$1,400 m) which is wasted each year it is on the grounds that as there is no sufficient cold storage facilities, reefer trucks, cool chain offices and absence of other framework underpins (Viswanadham, 2006). The cold storage system in India is very complicated as there are more small players or stakeholders like agriculturist, distributer, processor or producer, and retailer. Each accomplice works in remoteness to the other. Indian items have the lower yields, and the insufficient preservation methods increases the final result costs

significantly with absence of reasonable handling status assortments. There are many inhibitors which influence the productivity of the cold chain as well as impact each other fundamentally.

Small and Medium Enterprises (SMEs) plays an important role in the economic growth of any country. India has 30 million SMEs and they contributed around 17 percent to India's GDP in 2017. In India, the units are basically classified on the basis of their investment in plant & machinery. Below is the classification

Description	Manufacturing	Service
Micro	Up to USD 62,500	Up to USD 25,000
Small	Above USD 62,500 and up to USD 1.25 million	Above USD 25,000 and up to USD 0.5 million
Medium	Above USD 1.25 million and up to USD 2.5 million	Above USD 0.5 million and up to USD 1.5 million

Source: Small & Medium Business Development Chamber of India, 2017

As we know there is need to process perishable items, fruits, vegetables etc. in order to increase their storage or shelf life considerably. The process of the supply chain of fresh produce from the farm to the folk (end point of consumption) is highly complex. Post- harvest management activities include from cooling, handling, storage, processing, packaging, transport and making fresh product available in market. It is necessary to have adequate cold storage facility to prevent perishable items from getting waste. It has been noted that nearly 40 percent of the fruits and vegetables are wasted yearly due to lack of cold storage. We can say that there are numerous challenges involved related to cold storage facilities like ownership by SMEs, huge investment, institutional issues, high energy costs and temperature variability adding to the corrosion of the fresh produce.

Due to insufficient cold chain facilities, logistical infrastructure and post-harvest handling activities Indian cold chain industry is still on developing stage. Still, there are opportunities to develop the cold chain sector in India. The paper will explore the future of cold chain, it tells us about the current scenario of cold chain in India. So that that current perspective should be kept in mind while designing future cold chain so improvements can be done

3. Methodology

We have conducted a survey based questionnaire. This is because a survey based questionnaire in our case addresses the specific research issues related to cold storage facilities. In this research, we have selected primary data because the opinions to the questions posed in the survey are filled by the MSMEs in cold chain sector. It had addressed the specific research issues which MSMEs are facing specific to their own situations. Also, we can rely on the data as it has been directly collected from the MSMEs involved in cold chain sector.

The data collection was done through Primary and Secondary resources. The primary data is the data which is collected through interviews and questionnaires etc. The secondary data is the existing data which is collected by some other researcher. Questionnaires include both open-ended as-well-as closed-ended questions. While the open-ended questions provided general information the closed-ended questions shall restrict the answers to the requirement of this research (Ranjit Kumar; 2014). All data shall be collected during the month of October 2017.

According to (Saunders, M., Lewis, P. & Thorn hill, A. 2012) convenience sampling has been used as one the method for collection of data. This was done because of limited number of SMEs into cold storage and limited time. So a list of 21 identified SMEs in cold storage was obtained (Data from Accord Fintech). Convenience sampling, also known as availability sampling. It is specific type of non-probability sampling method that relies on data collection from population members who are conveniently available to participate in study. Convenience sampling is a type of sampling where the first available primary data source will be used for the research without additional requirements. It is the sampling method which involves getting participants wherever we can find them and typically wherever is convenient. In convenience sampling no inclusion criteria identified prior to the selection of subjects (Saunders, et. al., 2012). Some uses of convenience sampling are sampling are ease of availability of data, time saving, money saving and also it is useful in pilot study as these findings can serve as pointers and we deciding further line of action. It also has limitations as data can be biased as some groups are over-represented and some groups are under-represented, there can be high possibility of sampling error and result also can't be generalized as the respondents are not representative of entire population. (Deepa Karnadikar, 2016)

The analysis of the data collected through the survey questionnaire helped us in knowing the wastage that happened because of inadequate cold chain facilities and helped us in identifying gaps and finally suggest bench-marking parameters, such as, renewable energy, innovative technologies, etc., for development of cold-chain infrastructure..

4. Results and Discussions

In India, there are around 6,300 cold storage facilities which are unequally present across the whole country. Most of the cold storages are used for storing of potatoes around 75%. But today we can see that the market is progressively getting organized. Also, more than 50% of cold storage are currently situated in Uttar Pradesh (UP) and West Bengal (2017). Some facts about Indian cold chain industry are

- Only 8 to 10 percent of cold storages are in the Organized sector.
- Capacity of Most cold storages around 36% have capacity below 1,000 MT
- According to current capacity of cold storages around 11% of produce can be stored.

- From the survey, we were able to identify 21 companies in SMEs category which are into cold storages.

Response was collected from 31 Cold Storages; 21 SMEs and 10 MSMEs which are on border line of SMEs and MSMEs. In the response, we came across the ownership factor. Each company owns a cold storage it was possible because of the subsidy factor in investment by Ministry of Food processing, National horticulture board etc.

Also, a major question was asked regarding to capacity utilization of cold storage. Majority of them answered with full and 100%. After a telephonic conversation with these 31 identified SMEs it was noticed that they utilize their capacity more than full i.e. around 130-140% as there is lack of cold storage in some areas. Today government have taken various steps for reduction of waste that happen due to lack of cold storage facilities. For this government has started encouraging private sector to develop the cold chain industry by implementation of the latest and most efficient refrigeration equipment solutions available today.

For the construction of cold storages initial investment requirement is high which is the biggest challenge today. Now government is trying to solve this problem by giving various subsidies, schemes on construction of cold storages. Some of the initiatives are-

- 100% FDI through government route
- 35-40% Subsidy of project cost.
- Easy funding options
- Establishing National center for cold chain development
- Also, many tax incentives and tax holidays are being favored to cold storage companies.

It is developing economies such as India it is more difficult to operate. As there is back support of healthy infrastructure and there are limited or no uncertainties in the logistical chain in developed countries. Logistical chain has to face number of challenges in emerging economies due to uncertain environment, poor infrastructure and ambiguity in accessibility of some basic requirements like water, power etc. So well applied strategies and policies cannot be applied in developing economies as they have to be modified accordingly, this is also the reason why strategies fail when they are applied to emerging economies the same way. McDonald can be a good example for cold chain as it has an efficient and developed cold chain facility in the USA but after entering India it took around 4 years and 450 cr. to set up its cold chain network.

5. Conclusions

This empirical study has made an attempt to identify the crucial factors that are hindrances in the development of the cold chain sector in India It were watched that the absence of satisfactory framework alongside high cost for establishment and operation are the greatest disadvantage for strong and efficient cold chain. In India logistics cost is evaluated around 15-25 percent as compared to logistics cost in USA and UK which is around 7-9 percent (Swami Nathan, 2007). The main reason is lack the absence of required infrastructure. In India operating expenses for cold storages is twofold when contrasted with cost of cold storages USA and UK. Additionally, High import duties and excise duty make setting up cold storages troublesome, unviable and uneconomical. The Government needs to support cold chain players in their initiatives and provide for a more encouraging environment by continuing to upgrade infrastructure and other facilities needed in development of cold storage. Some tax incentives like tax holidays for investing in cold chain infrastructure sector should be given. There should be 100 percent depreciation on freezer cabinets and other cold chain equipment's. Also, import duties on all capital equipment's of cold chain sector should be reduced to 4%. (Khan, 2005)

The research was conducted for SMEs in cold chain sector. The study has mainly concentrated on the initial investments, various government subsidies, capacity of cold storage and other constraints involved in cold storage operations. Only SMEs who are into cold chain have been taken into consideration. The study throws light on different problems faced by the cold storage units in maintenance and farmers/traders in stocking their produce in the cold storage units.

The study has limitation of less data available as there were only 21 SMEs who were into cold storage. Also, the owners of the cold storages were generally suspicious of the motives of any investigation because of fear of taxation. So, the research had to face some drawbacks in getting the accuracy data's. Quantitative data was collected from various cold storage units in a very limited period of time and for a limited sample size. Hence, generalization of the results was attempted carefully.

6. Acknowledgement

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7. References

1. Amjadi, K. (2005). Integrating food hygiene into quantity food production systems. Nutrition and Food Science, 35(3): 169-183.
2. Accord Fintech, 2017; unpublished data.
3. Banerjee, A. (2007), President's desk, Indian Dairyman, 45(4):1-2.
4. Banco, A.M., Masini, G., Petracci, N. and Bandoni, J.A. (2005), "Operations management of a packaging plant in the fruit industry", Journal of Food Engineering, 70(3): 299-307.

5. Beamon, B. M. (1999). Measuring supply chain performance. Int'l. Journal of Operations and Production Management, 19(3): 275–292.
6. Berger, H. (2007), "Dealing with dynamics engineering solutions to the dairy dilemma", Trends in Food Science and Technology, 18(1):123-34.
7. Bishara, R.H. (2006), "Cold chain management – an essential component of the global pharmaceutical supply chain", American Pharmaceutical Review, available at: www. americanpharmaceuticalreview.com/life_science/Bishara_APR.pdf, Accessed: 10-Sept. 2017.
8. Blanco, A. M., Masini, G., Petracci, N., and Bandoni, J. A. (2005). Operations management of a packaging plant in the fruit industry. Journal of Food Engineering, 70(3):299-307.
9. Bogataj, M., Bogataj, L. and Vodopivec, R. (2005), "Stability of perishable goods in cold logistic chains", Int'l. Journal of Production Economics, 93/94:345-56.
10. Brouwers, T. (2006), "India report Part 1: dairy giant walking barefoot", available at: www. milkproduction.com/Library/Articles/India_part_1dairy_giant_walking_ barefoot.htm Accessed: 10-Sept., 2017
11. Christopher, M. (1992) Logistics and Supply Chain Management (1st ed.). London: Financial Times/Pitman, Available at: http://pdfcast.org/pdf/integrated-logistics-and-valuechain- management-a-new-model-approach-to-value-chains. Accesses: 10-sept,2017
12. Chan, F.T.S., Chan, H.K., Lau, H.C.W., and Ip, R.W.L. (2006). An AHP approach in benchmarking logistics performance of the postal industry. Benchmarking: An Int'l. Journal, 13(6): 636–661.
13. Da Silva, C. A., and Filho, S. M. D. (2007). Guidelines for rapid appraisals of agrifood chain performance in developing countries. Agricultural management, marketing and finance occasional paper. FAO, Rome. <www.fao.org/AG/agS/ publications/docs/AGSF_OccassionalPapers/agsfop20.pdf> Accessed 3-Sept., 2017.
14. Deepa Karandikar "Advantages and Disadvantages of convenience sampling" Available: https://www.buzzle.com/articles/advantages-and-disadvantages-of-convenience-sampling.html Accessed: 30-Oct 2017
15. Donk, D.P.V., Akkerman, R. and Vaart, T.V. (2008), "Opportunities and realities of supply chain integration: the case of food manufacturers", British Food Journal, 110 (2):218-235.
16. Fearne, A. and Hughes, D. (2000), "Success factors in the fresh produce supply chain: insights from the UK", British Food Journal, 102(10): 760-772.
17. Folinas, D., Manikas, L., and Manos, B. (2006). Traceability data management for food chains. British Food Journal, 108(8):622–633.
18. Gorton, M., Dumitrashko, M., and White, J. (2006). Overcoming supply chain failure in the agri-food sector: A case study from Moldova. Food Policy, 31(1): 90–103.
19. Govt. of India MSME Annual Report 2016-17 Available: http://msme.gov.in/relatedlinks/annual-report-ministry-micro-small-and-medium-enterprises accessed 20-Sept, 2017
20. Heng Luo, Minjie Zhu, Sengang Ye, Hanping Hou, Yong Chen, Larissa Bulysheva, (2016) "An intelligent tracking system based on internet of things for the cold chain", Internet Research, 26(2):435-445,Available: https://doi.org/10.1108/IntR-11-2014-0294 Accesses: 10-sept 2017
21. Jahre, M. and Hatteland, C.J. (2004), "Packages and physical distribution: implications for integration and standardization", Int'l. Journal of Physical Distribution and Logistics Management, 34(2):123-39.
22. Joshi, Banwet, D.K., Shankar, R., (2009) "Indian cold chain: modeling the inhibitors", British Food Journal, 111(11):1260-1283.
23. Kelepouris, T., Pramatari, K., and Doukidis, G. (2007). RFID-enabled traceability in the food supply chain. Industrial Management and Data Systems, 107(2): 183–200.
24. Khan, A.U. (2005). "The domestic food market: is India ready for food processing?", Conference on SPS towards Global Competitiveness in the Food Processing Sector, Monday, 5 September, Pune, India, available at: www.idfresearch.org/pdf/dommarket.pdf. Accessed: 12-sept 2017
25. Lee, H. (2002). 'Aligning supply chain strategies with product uncertainties', California Management Review, 44(3):105–119.
26. Manning, L., Baines, R. N., and Chadd, S. A. (2006). Quality assurance models in the food supply chain. British Food Journal, 108(2): 91–104.
27. Mangina, E., and Vlachos, I. P. (2005). The changing role of information technology in food and beverage logistics management: Beverage network optimization using intelligent agent technology. Journal of Food Engineering, 70(3): 403–420.
28. Montanari, R. (2008), "Cold chain tracking: a managerial perspective", Trends in Food Science and Technology, 19(8):425-431.
29. Negi, Saurav; Anand, Neeraj (2015), "Cold Chain: A Weak Link in the Fruits and Vegetables Supply Chain in India", IUP Journal of Supply Chain Management, 12(1):48-62.
30. Neeraj Arya "SMEs role in India's manufacturing sector Available: https://www.ibef.org/download/SMEs-Role-in-Indian-Manufacturing.pdf. Accessed 20-oct 2017
31. Regattieri, A., Gamberi, M., and Manzini, R. (2007). Traceability of food products: General framework and experimental evidence. Journal of Food Engineering, 81(): 347–356.

32. Ranjit Kumar :Research methodology: a step by step guide for beginners Available: SAGE Publications Ltd; 4 edition (14 January 2014)
33. Rijswijk, W. V., and Frewer, L. J. (2008). Consumer perceptions of food quality and safety and their relation to traceability. British Food Journal, 110(10): 1034–1046.
34. Salin, V. and Nayga, R.M. (2003), "A cold chain network for food exports to developing countries", Int'l. Journal of Physical Distribution and Logistics Management, 33(10):918-933.
35. Sahin, E., Baba □ı, M. Z., Yves, D., and Renaud, V. (2007). Ensuring supply chain safety through time temperature integrators. The Int'l. Journal of Logistics Management, 18(1):102–124.
36. Simchi-Levi, D., Kaminsky, P. and Simchi-Levi, E. (2004) Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies (2nd ed.), Tenth Reprint 2007. India: Tata McGraw Hill.
37. Swaminathan, J.M. (2007), "Managing supply chain operations in India: pitfalls and opportunities", International Series in Operations Research and Management Science, 98():137-54
38. Saunders, M., Lewis, P. & Thornhill, A. (2012) "Research Methods for Business Students" 6th edition, Available: Pearson Education Limited Accessed: 15-sept 2017
39. Taylor, D. H., and Fearne, A. (2006). Towards a framework for improvement in the management of demand in agri-food supply chains. Supply Chain Management: An Int'l. Journal, 11(5): 379-384.
40. Viswanadham, N. (2006), "Can India be the food basket for the world?", working paper series, available: www.isb.edu/faculty/Working_Papers_pdfs/Can_India_be_the_Food_ Basket_for_the _World.pdf Accessed: 12-sept 2017
41. Valeeva, N.I., Huirne, R.B.M., Meuwissen, M.P.M. and Lansink, A.O. (2006), "Modeling farm-level strategies for improving food safety in the dairy chain", Food Control, 17():108-13.
42. Vander Vorst, J.G.A.J., Tromp, S-O. And van der Zee, D-J. (2009) 'Simulation modelling for food supply chain redesign; integrated decision making on product quality, sustainability and logistics', Int. J. Production Research, 47(23):6611–6663.

8. Appendix Questionnaire

1. Do you own the Cold Storage? If yes, what are the capital costs?
2. What is the total Number of Employees in your organization?
3. Do you only store or sell or do both?
4. What are the products stored at the cold storage space /sold at the location?
5. What is the Annual turnover of the company?
6. Details about storage capacity and capacity utilization in last three years
7. Do you agree that there has been an impact of incentives i.e. subsidies, tax holidays etc. (so far provided by the Government for development of cold chain infrastructure)?
8. What is the possible percentage utilization of the subsidies?
9. What is the operating expenditure for running the Cold storage?
10. Whether you have availed any benefit under any scheme? (NABARD schemes)
11. What steps are taken for risks and mitigation steps (insurance)?
12. What is the Standard Operating Procedure(SOP) for managing cold storage (Quality testing procedure, security services)