Challenges of Regional and Urban "Smart" Cold Chain Solutions

- **Workshop: Innovations in Planning and Operations of Logistics Centers in China; Lessons Learned from International Experiences**
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I. Introduction-Unicold: Trained Workforce, All modes, Solar Panels
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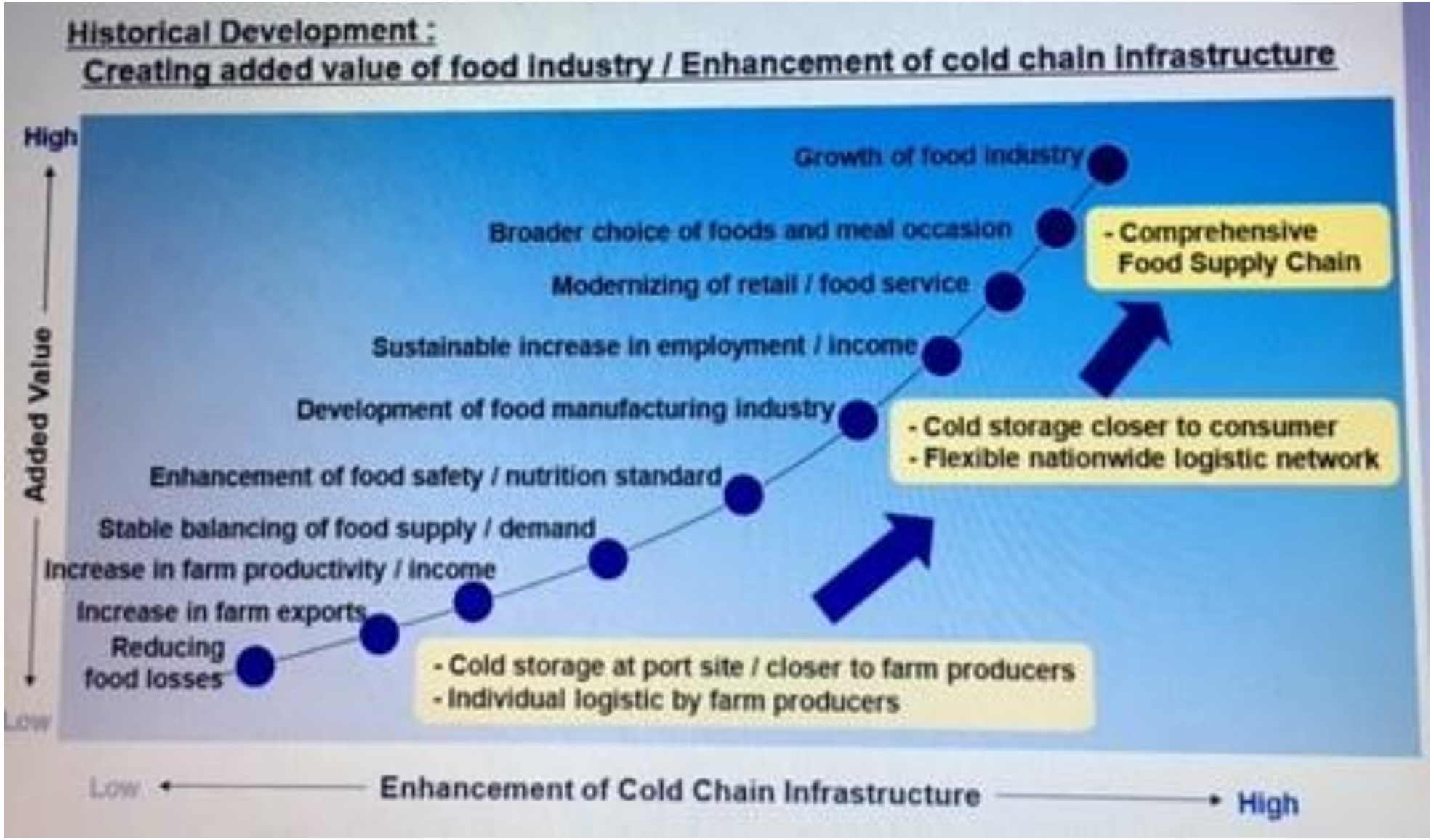
II. What are “Smart” Cold Chain Solutions?



II. A. Smart in Knowledge- Awareness Programs

- One third ($750 billion) of all food produced, globally is lost or wasted (food poisoning)-United Nations, Food and Agriculture Organization (FAO)

The **causes** are:

1.) Waste from oversupply

2.) Losses from natural decay which are accelerated by lack of temperature management or unhygienic conditions

3.) Spoiled food is mostly in the early and mid-stages of food supply chain

Shelf Life Model-Unnecessary Losses from Producer to Consumer. Shelf Life is a time span for which the product can be stored at a reference temperature. Time span that is left in total for transport, storage and display in store**.** **Temperature** is the most important factor influencing quality.

II. A. Smart in Knowledge-Awareness Programs

- Intelligent Food Logistics-Reduces Unacceptable Food Losses
- How? Capturing temperature data to adjust transport routes since shelf life depends on temperature deviations during transport and storage. Too many “hand offs”? Are shipments waiting outside of cold warehouses?
- Need technologies, machines/infrastructure in cold chain for food in:

1.) Production and Processing -sensor chips placed on pallets from fields

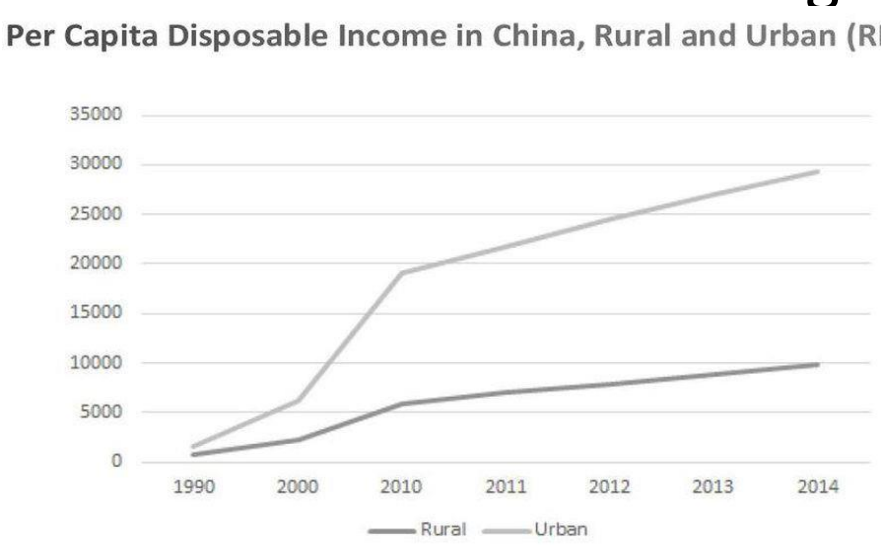
2.) Logistics-reefer trucks and containers-Different truck models available

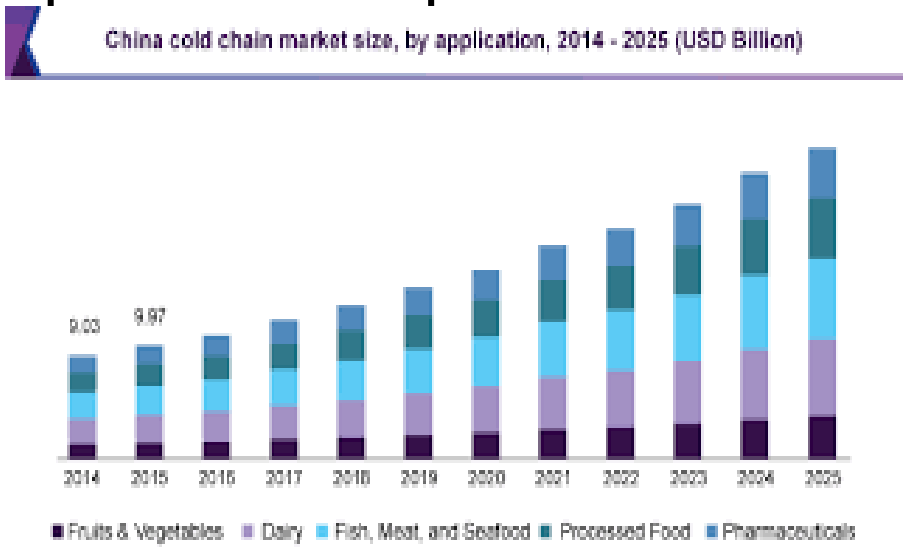
3.) Consuming markets-wholesale and retail supermarkets, etc.

Three steps are: **cooling** 10 C/-5 C-**chilling** 5 C to -5 C / **freezing** under -18 C

II. A. Smart in Knowledge-Awareness Programs

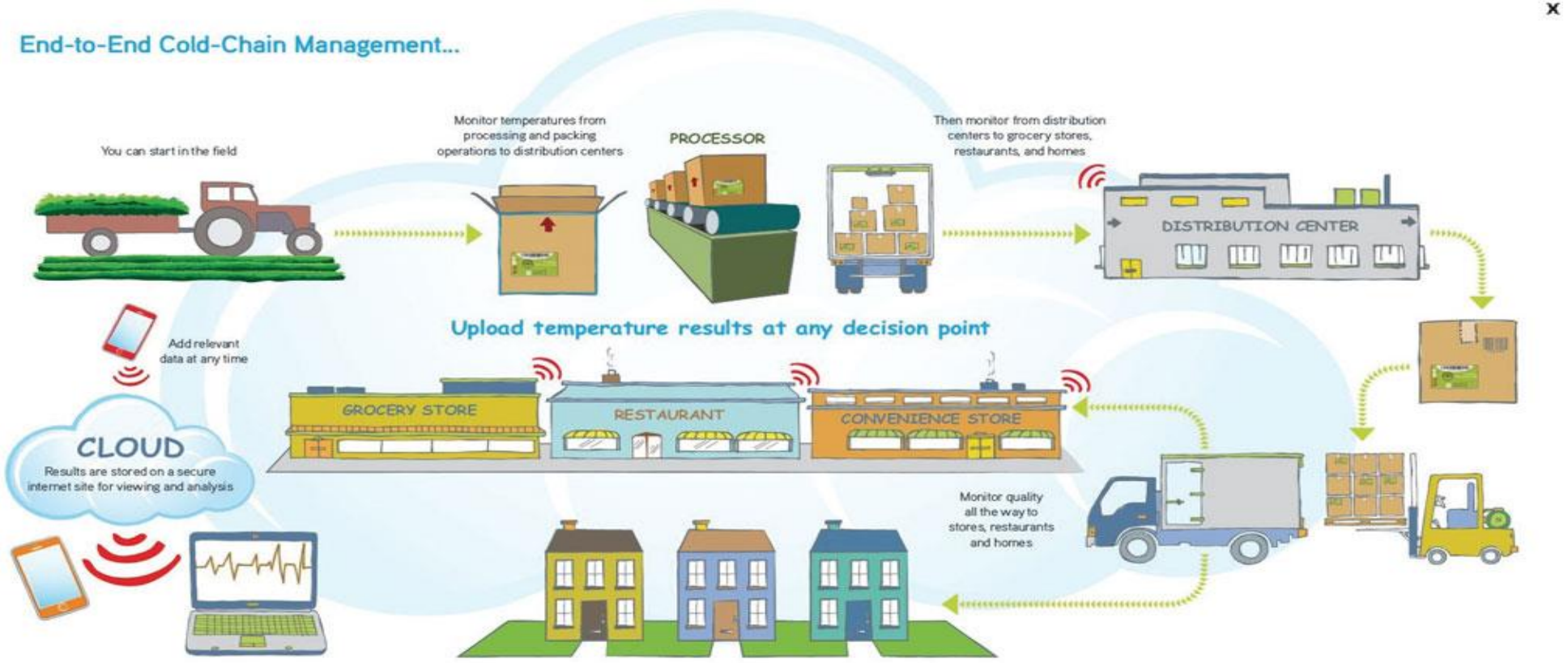
- Sufficient cold chain empowers agriculture, increased incomes, reduces poverty. Cold Chain development connects production, storage, processing, distribution and leads to food security, measurable supply, stable prices and better value chain. **End to End**
- Infrastructure and management is expensive and profits are difficult





II. B. Smart Technologies-Building Cold Chain

- Innovation is an elusive combination of people, processes and technologies. Processes need to be defined first since technology alone will not solve food waste and loss to ensure shelf life. Hy-Vee:



II. B. Smart Technologies-Building Cold Chain

- **Hy-Vee Grocery store Chain**, USA and TempTrip Software Company
- Hy-Vee requires food suppliers to use TempTRIP temperature monitoring solution of RFID (radio frequency identification) tags, readers and antenna system with every order.
- ***Communication and sensing systems for remote quality supervision gives real-time temperature monitoring solution.*** The solution looks at the quality of the load and points out the issue in the first place to the suppliers. For example, is the lettuce wilted and stressed?
- **Intelligent Containers-** Global Tracker, a Danish company involved in sensor-based tracking and Kazakhstan Temir Zholy (KTZExpress), a logistics service provider for Eurasian trade and the Khorgos Special Economic Zone with China, for real time monitoring and alarms of temperature sensitive goods. The sensors inside the cargo area collect temperature and door event data and alarms can be set if the temperature is exceeded, then the sensor will wake up the device to send an emergency alarm communication. ***Controlled Atmosphere containers are energy saving with more space for 1,080 boxes of bananas.***

II. B. Smart Technologies- Building Cold Chain

- **Trends** in China and USA are for more cold chain warehouses: e-grocery/on-line grocery/restaurant sales will increase total area for cold storage.
- **Demand** will cause land, construction and energy costs to increase.
- **The Solution** is for new cold storage space to ***go vertical***. New construction has ceiling height of 36-40 feet compared to 22 feet average height in the past 20 years. Heat infiltration is greatest through the floor and roof. Taller buildings have better energy efficiency than lower or wider buildings with similar volume. Power to cool inventory can be 25 percent of operating costs.

II. B. Smart Technologies-Building Cold Chain

- Cold storage facilities involve **inventory management** to monitor food for First Expired First Out (FEFO). The implementation of smart distribution practices, such as FEFO, should start with a complete analysis of the supply chain process and environmental conditions.
- The analysis should include the monitoring of deviations of the product temperature along the chain by data loggers or wireless sensors as the first step. The second step is the evaluation of the related effects by biological models. The results of the analysis will reveal **where most of the shelf life is lost** in the chain

III. Shaanxi and Xi'an and Spanning the Globe

- **Consumer retail markets**:

1.) Traditional Trade-"Wet Markets" **rural** access and lower prices-What Percentage?

2.) Modern Trade-Super/hyper markets, small stores-**urban** access-What Percentage?

-Need work for this TA to determine rural-urban agriculture produce transfers?

-this points to **affordability and gradual acceptance** of cold value chain from farmers to consuming stakeholders

- **PRC Policies**: Food Safety and Cold Chain-Cold Chain Logistics Development Plan of Agriculture Products 2010-How is this Implementing in Shaanxi and Xi'an?

- Low level knowledge and training from producers to consumers of cold value chain

III. Spanning the Globe

- **United States**-Occupancy rate for cold storage warehouse is 85%+

-Food manufacturing is 33%; wholesalers 33%; retailers, 22%; pharmaceuticals, 12%; e-grocery, 3%/$19 billion->13%/$100 billion by 2024 to require adding 35 million square feet industrial space for cold storage

- **Gambia**-www.farmfresh.gm-infrastructure poor of roads, high utility costs and reliability. Generators cause loss of profits. Solar panels are expensive
- **Malaysia**-Yamato Holdings-chilled parcel delivery for on-line sales. Only 2% is cold
- **Thailand**-Yokohama Reito cold storage for 50 companies. Focus on personnel development such as truck driver skills with incentives.
- **Philippines**-Sumifru Corporation subsidiary of Sumitomo supplies 30% of bananas sold in Japan. Fully temperature controlled supply chain from fields to stores. Dedicated refrigeration facilities after harvest, then ripen bananas in Japan with ethylene gas. Is temperature control 24/7 over 2 weeks. Numerous constraints exist.
- **PRC**-Shandong i-Logistics j.v. with Itochu Logistics at Qingdao Port frozen storage.
- **Vietnam**-Low demand by retailers. Low level of temperature control in rural areas

IV. Challenges To Modernize-Lessons Learned

- Shaanxi Logistics Association and Yangling cluster (farmers, university, logistics companies, government, retailers, wholesalers) relationships are strengthened and public-private dialogue institutionalized. Additional stakeholders are software engineers and agri-food scientists for pilot testing end to end temperature technologies to preserve shelf life, reduce losses and waste and increase food safety/supply of higher quality agriculture produce, locally farmed.
- Working groups formed in the Association/cluster for training. Japan cold chain management development had a human resources program at all levels. Food and processed food companies provided training with guidelines, manuals, handbooks to disseminate the same level of standards. Can China Federation of Logistics and Purchasing, Cold Chain Department assist in training, international standards?
- Cold chain infrastructure is expensive and takes time for markets to afford added cost/value. Gradual awareness and training programs could lessen the impact as “wet markets” give way to more modern trade infrastructures and practices.