INSTITUT INTERNATIONAL DU FROID
INTERNATIONAL INSTITUTE OF REFRIGERATION

The Cold Chain in Hot Countries

IIR Working Group of Commissions B2, C2, D1 and D2

TERMS OF REFERENCE

BACKGROUND

Refrigeration is the only technology that is able to increase the shelf life of products while preserving the original physical, chemical, nutritional and sensory properties that the consumers want. In fact, refrigeration can considerably reduce microbial growth in foods as well as the speed of many undesirable chemical and physiological reactions that alter the quality of the foodstuffs.

However, the protective action of refrigeration does not last beyond the time of its application. This means it is necessary to put a cold chain in place in order to keep perishable foodstuffs refrigerated all the way from the producer to the consumer (during all of the stages: production, packaging, handling, storage, transportation, distribution, consumption, etc.) so as to provide the consumer with healthy and safe products.

ISSUES

- **Food security**

In hot countries, where microbial growth is faster as a result of high temperatures, the use of refrigeration must be regarded as essential.

Around 80% of the world's population lives in developing countries (the majority of these countries have a hot climate: equatorial, tropical or Mediterranean) and it is estimated that 50% of the population of these countries live in towns with increasingly severe food supply problems as they are still without refrigeration.

However, in hot/developing countries, the emphasis is put on an increase in agricultural production and they are very little inclined to refrigerate agricultural products. It is the reason why post-production losses are considerable, whether in the field, during transportation, in storage or during distribution. These losses can be defined as "a decrease in food quantity or quality".

For example, for fruit and vegetables, losses can vary from 1 per cent to around 3 or 4 per cent; from a country like the United States (losses of around 12%), where the volume of available refrigerated storage is 300 m^3/1,000 inhabitants, to a country like India (losses of around 40%), where the available volume is only 75 m^3/1,000 inhabitants.

Moreover, on a global scale, it has been announced that around 400 million tonnes of perishable foodstuffs intended for consumption are lost each year because of insufficient use of refrigeration.

Resorting to refrigeration technologies would thus contribute towards creating a better food supply for populations in hot countries in terms of both quantity and quality, and it would also combat malnutrition.

Refrigeration is not only necessary for ensuring food security for populations, but also for encouraging the development of some activities, such as agri-food industries and commercial exchanges, and even for promoting the growth of tourism.

However, this area must address the specific features of these countries

- ⇨ The first issue to address is that of making the rapid cooling of animal and plant products as soon as possible after production widespread.
- ⇨ Another essential concern is to prevent any break in the cold chain that links the producer to the consumer (particularly during transitions between the different modes of transport and/or the warehouses)

In comparison, in industrialised countries, the improvements in the cold chain are undeniable due to pressure from the consumer who demands that every food product be completely safe. The improvements probably lie more in transparency, information and traceability than in new technological developments.

In hot/developing countries, some procedures are being developed, particularly for export needs. The use of household refrigeration appliances is also growing quickly. Some links, however, are slow to be put in place: refrigerated storage at the places of production, refrigerated transportation and refrigeration at retail outlets.

According to the International Institute of Refrigeration (IIR), establishing cold chains for perishable foodstuffs in developing countries that are on the same level as cold chains in industrialised countries would enable these countries to have at least 15% more food availability.

- **With regard to health**

Refrigeration is also indispensable to the storage and transport of certain health products, for example, vaccines, which have to be maintained at a certain temperature to be effective.

- With regard to the environment

Under the Montreal Protocol, developing countries must eliminate the use of hydrochlorofluorocarbons by 2030, even though, nowadays, it is the most commonly used refrigeration technology. Any replacement solution must have both a smaller greenhouse effect (a refrigerant that has a weak potential greenhouse effect and also good energy efficiency) and meet sufficiently strict safety requirements. In addition, as refrigeration represents a growing percentage of electricity usage, including for air conditioning, even though energy infrastructures are often inadequate, it is preferable to promote energy efficient solutions which, wherever possible, use renewable energy sources. Technical solutions that are used by developed countries cannot always be transposed just as they are, as the generally higher ambient temperatures will modify the equipment's efficiency and therefore the problems arising in training and maintenance.

So, the implementation of an initiative designed to lay the groundwork for a global reflection on the challenges of Cold Chains in hot countries is necessary, and is central for:

- ⇨ identifying major obstacles which impede the development of a Cold Chain in hot countries,
- ⇨ showing the importance of a cold Chain in the improvement of food and health safety in these countries, both for their economic and social development, and as part of the struggle against malnutrition,
- ⇨ supplying insights and offering recommendations on how to develop an efficient Cold Chain in hot countries / developing countries.

It is in this context that the International Institute of Refrigeration (IIR) proposes a new initiative to create a working group on Cold Chains in hot countries/developing countries. This working group will bring together all the Cold Chain stakeholders mentioned in Article 4 of this document.

OBJECTIVES

The objectives of the WG on the Cold Chain in hot countries are:

- to participate in national efforts by hot countries / developing countries which are aimed at reducing post production losses and preserving food resources,

so as to increase its availability, by heightening the awareness of policy makers of the importance to both producers and consumers of respecting the Cold Chain;
- to improve the provision of food to towns and expand international commerce in food products;
- to reflect the importance of the latter technology and contribution to food and health security in hot countries and in general, the role for alternative low GWPs and technology choices in guiding the countries towards low carbon or carbon neutrality;
- to control the market and stabilise costs;
- to dissociate 2 types of cold chain: Product side (food, biological etc.….) and Equipment (technology, components etc.…);
- to open up new markets for some foodstuffs and to create new economic activities;
- to contribute to the improvement of revenues and create employment;
- to promote the adoption of healthy and balanced nutritional and consumption habits.

Specifically:

- to identify the problems that hot countries have with preservation, storage, transport and distribution; to analyse the materials and procedures of local refrigeration production;
- to develop and put forward a national strategic plan for implementing a Cold Chain or for developing and improving that which already exists in certain countries;
- to develop synergy and co-ordination between the different stakeholders in the refrigeration field; to promote the successful completion of actions relating to the development of a Cold Chain;
- to offer guidelines updated by IIF on how to handle, transport and store perishable products, as well as the related standards and legislation
- to enable the country's dual benefits of addressing cold chain needs and meeting national obligations under international multi-lateral environmental agreements
- to provide the necessary recommendations to develop an efficient Cold Chain in hot countries / developing countries
- to consider the social, economic, technical and environmental aspects adapted for hot countries.

AREA OF NETWORK INTERVENTION

The WG is interested in strengthening the cold chain supply in hot countries/developing the levels of the entire food value chain in particular the stages

shown below and this, with the aim of improving food security and the fight against malnutrition:

1. Processes post-harvest or post-production
2. Conservation and storage
3. Transformation
4. Transport
5. Distribution
6. Consummation

The WG is interested in all products or product groups that are important in terms of the economy of hot countries particularly the following product groups:

a) Plant products: Mainly fruits, vegetables and tubers (potatoes)
b) Animal products: Red meats (cattle, sheep, goats…), white meats (poultry) and eggs, fish and seafood (crustaceans and cephalopods), milk and milk products, etc…

DELIVERABLES

- establish the necessary definitions for the dissemination and introduction of the concept of the cold chain (definition of technologies, identification of the products concerned, different stages involved, participants…);
- prepare an analysis on the cold chain in each country- what is the current technology in place, what could be available technologies and what are barriers from accessing these;
- identify problems linked to obstacles at the level of each link of the food value chain for the development of an effective cold chain; research and propose adequate solutions;
- examine diagnostic studies that have been carried out (on a national level in targeted countries) with regard to evaluating the state of these places;
- create and propose a national strategy for the development of an effective cold chain;
- establish a preliminary plan of action to establish an effective cold chain in hot countries;
- act as a reference point and guide for activities relating to the cold chain in hot countries;
- assure communication and exchange of information about problems and solutions for the development of an effective cold chain, and to raise awareness among the different participants;
- prepare a training program for a course on ‘good cold chain practice’, including modules for each one of the different pathways in the cold sector;

- initiate and develop collaborative research projects when it comes to establishing an effective cold chain;
- create an information note;
- organise conferences and technical workshops, create publications…

MEMBERSHIP

The members of the Working Group should be:

- members of Scientific and Technical Commissions B2, C2, D1 and D2 of the IIR;
- Private or collective members of the IIR;
- Experts or specialists whose knowledge or scientific input in this field would be considered beneficial for the Working Group.

The member's contributions will concern the following:

- sharing of information;
- promotion of the WG (website link);
- support and contribution to the WG activities and the development of the action plan;
- sponsorship of WG activities.

STATUS OF THE WORKING GROUP

The Working Group is based on voluntary contributions. There is no funding provided by the IIF to WG members (travel, accommodation and other expenses).

COMMISSIONS INVOLVED

The Working Group will involve Commissions B2, C2, D1 and D2.

CHAIRMAN AND BUREAU

President: Halima Thraya

Vice-President: Judith Evans

Secretary: Ina Colombo from the IIR office

OPERATION OF THE WORK GROUP

The WG operates on a temporary basis and will carry out its activities through the exchange of electronic information for all members (electronic discussion group) or through physical meetings. With the aim of facilitating communication, a directory of members will be put on the website of the work group, which will allow direct contact via email.

The members of the WG will meet as many times as judged useful and possible, at least once a year as convened by the Chair to debate the issues raised on the established agenda, and communicated to members at least two weeks before the date of the meeting.

This committee will choose, during its first physical meeting, the member or the institution charged with permanent leadership among its members. This institution will ensure the permanent secretary and the motivation of the WG. The 3 Vice-Presidents will also be elected.

Each important decision will be sent to all the members of the work group by email, which is the responsibility of the work group presidents.

Decisions will be taken during long-distance or physical meetings by general consensus; if this process fails, the majority can be reached if the quorum of 2/3 among voters is met.

RUNNING – MEETINGS

The possibility of holding a meeting of members soon after the setting up of the Working Group will be examined. Such a meeting could be held during:

- A First meeting of the Working Group on the cold chain in hot countries, will be held during the International Congress of Refrigeration to be held in Yokohama, Japan from 16 to 22 August 2015
- A second meeting of members will be held on the occasion of the Gustav Lorentzen Conference on natural refrigerants in Edinburgh, Scotland from August 21-24, 2016.
- A third meeting of the Working Group will be held at the occasion of the IIR Seminar on the «logistics for transport of foodstuffs under controlled temperature in hot countries» in Tunis, Tunisia from October 25-26, 2016.

SUB-COMMITTEES

The Working Group may set up sub-committees so as to study specific topics.

WEB PAGE

A web page shall be set up in order to disseminate relevant information on “The Cold Chain in Developing Countries” and to promote the activities of the working group and the IIR.

The site will be periodically updated thanks to technical assistance from the head office of the IIR, under the responsibility of the President of the Working Group.

It will be linked to the web pages of Commissions C2, D1 and D2 on the IIR Web site.

Also in order exchange documents, a Dropbox file will be set-up to enable members to upload and download documents. This file will be administrated by IIR, the chairman and bureau.

EXISTING IIR PUBLICATIONS

Refrigeration techniques in warmer developing countries. [See]

Recommendations for the processing and handling of frozen foods. [See]

Recommendations for chilled storage of perishable produce. [See]

Cold store guide. [See]

Guide to refrigerated transport. [See]

Control of the cold chain for quick-frozen foods handbook. [See]

Guide to solar refrigerators for remote areas and warm countries. [See]