

Vacuum cooling solutions for food products- Arvaia

Campden BRI Hungary

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Project code:

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Dissemination Level		
PU	Public	
PP	Restricted to other program participants	
RE	Restricted to a group specified by the consortium	
CO	Confidential, only for members of the consortium	

1. Title of the case description

VACUUM COOLING SOLUTIONS FOR FOOD PRODUCTS

2. Indicate your role in the Smart Food Supply Chain:

- individual member of the chain:
- chain operator:
- network operator:
- association:
- technical, scientific, or management expert:
- advisor:
- policy maker:
- other:

3. Indicate the region (if applicable): world-wide supplier network

4. WP2 Cross-reference table

Please indicate with an X in the relevant box of the matrix for which needs and the steps / functions of the supply chain the described innovative solution is applicable

		Individual steps of the SFSC							Short food supply chain as whole						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Needs of the consumers (citizens)	food safety		X		X					X	X	X			
	food quality		X		X					X	X	X			
	trust										X	X			
	ethical aspects														
	accessibility														
Needs of the chain actors	fair price														
	increased negotiating power														
	shared use of available resources														
	product development support														
	access to markets and consumers														
	access to infrastructure														

- 1: Farming**
- 2: Primary production**
- 3: Transport**
- 4: Processing and packaging**
- 5: Storage**
- 6: Logistics**
- 7: Sale**
- 8: Product integrity, authenticity, transparency**
- 9: Marketing concepts**
- 10: Food chain management and networking for enhancing cooperation among chain actors**
- 11: Business modelling**
- 12: Policy environment**
- 13: Legal requirements**
- 14: Labelling**

5. Short description of the innovative solution

- **Describe the specific need or problem being addressed by the case and please explain what is the novelty of this innovative solution**

Vacuum cooling solutions– need raised by Arvaia, Italy

The most important problem of Arvaia is that it does not have an efficient cold chain yet. The products cannot be pre-cooled.

After harvesting fresh vegetables and fruits have high terroir heat content in the summer on the field, which causes fast quality and nutritional value decrease of the fresh products.

This is a post-harvest, high speed pre-cooling method directly on the field or in the packing house in the aim of the extended shelf life and quality preservation of the fresh product.

- **Describe the enabling function(s) and the practical benefit(s) - (e.g. for which types of problems and opportunities is used and can it be used, and how)**

The system can remove heat from the fresh products directly on the field or in the close area of the field. Practically, the temperature of vegetables and fruits could be dropped to 1°C-2°C within 15-30 minutes with the vacuum cooling method. Fixed vacuum cooler and mobile vacuum cooling machines (moveable on field) are applicable.

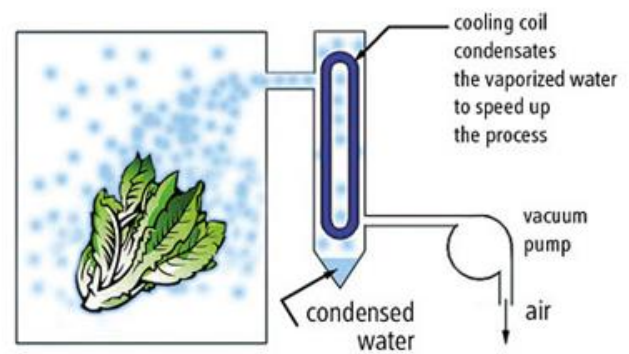
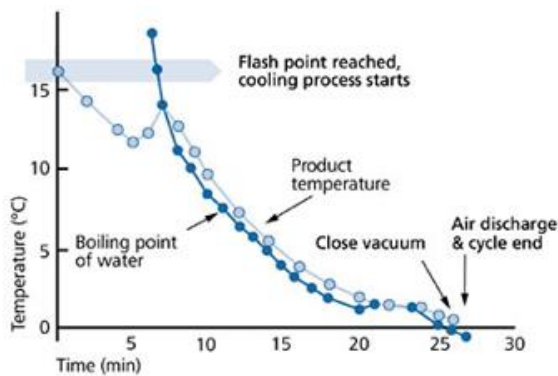
Uniform (the surface and even the core has the same temperature) and quick cooling is enabling by the fresh field plants.

- Describe the method/procedure/technology/solution implemented. (Please explain, whether the innovative method is a product / service / process / marketing or organizational / management innovation) After completing the description, please indicate, whether this innovation is a technological or non-technological one.

Vacuum cooling is a **pre-cooling, postharvest method** where the produce is cooled down by vaporizing moisture from inside the product itself. This vaporizing takes away energy in the form of heat from the product, and this ensures rapid cooling down, normally within 15 – 30 minutes for most products.

technological

non-technological



1. Figure: The process of vacuum cooling

The fixed and the mobile vacuum chambers:



2. Figure: Fixed vacuum cooler chamber



3. Figure: Mobile vacuum cooler machine

- **Describe the business, which implemented the innovated solution (size, country, region, location, type of food)**

The successful user of the vacuum cooling system can be a small/medium sized business or a multinational company, independent of the size of the business. The size and the capacity of the required vacuum chamber depends on the volume of the production, in case of fresh fruits and vegetables depends on the volume of the crop yield.

The most preferred foods are the fresh products, where by the quality and safety destruction must be stopped in time, e.g. straight after harvesting.

The location is up to the need of the user and the applied processing technology. The fixed vacuum cooling chambers can be set up in small processing plants, in factories, or direct on the fields, eliminate by this time and shipping costs.

- **Describe the distribution channels of the product(s)**

The pre-cooling system enables local (in place) packaging for the producer (field-packed products), without transport to a cooling house. After cooling and packaging any regular distribution channels are available.

- **Describe what makes the innovation work.**

- this is a pre-cooling postharvest technology for the removal of the field heat
- minimal process system
- existing fix and mobile system
- fast removal of the field heat in vacuum due vaporizing after harvesting
- uniform cooling, same temperature (as well on the surface as in the cold junction)
- individual parameter settings for the different products
- preserve quality and taste
- substantially longer shelf life of the fresh produce
- specific developed control system
- save on energy costs
- vacuum cooling methods are much more effective and modern than the traditional technologies
- mobile, it is possible to move by truck trailer e.g. to the field, direct to the harvest place
- in cooperation with other farmers, the utilization of the vacuum cooling system is more beneficial, the costs can be shared among the partners
- different capacities are available

- **Describe the specific prerequisites for the business related to the implementation of the method and/or related to the location, method, procedure, solution**

a: List the relevant necessary resources (including the estimated cost) for the specific innovation.

Please list the relevant ones only (list is annexed)

MATERIALS:

- fresh vegetable and fruits
- local perishable, freshly harvested field products

HUMAN:

- human resource for operation (1-2 persons)

TECHNOLOGY:

- the fixed or the mobile equipment of the vacuum cooling system (vacuum cooling chamber, vacuum pump, evaporator, refrigeration system, compressor).

FINANCIAL

- estimated cost: depends on the size of the chamber

b: List the relevant necessary capabilities for the specific innovation.

Please list the relevant ones only (list is annexed)

FOOD SAFETY:

- due the extreme fast pre-cooling method the food safety and the shelf life of the fresh field produce can be extended

FOOD QUALITY:

- due the extended shelf life the food quality and the freshness can be maintained longer

- **The method/technology was established by**

NAME: WEBER COOLING INTERNATIONAL

ADDRESS: Gildenweg 16 – 3334 KC Zwijndrecht – the Netherlands

DEALER AND SERVICE POINTS: Austria, Bulgaria, Canada, China, Czech Republic, Colombia, Equator, Finland, France, Germany, Germany North, Germany South, Greece, Hungary, Italy, Japan, Kenia, Mexico, Philippines, Poland, Romania, Romania (Transylvania), Russia, Scandinavia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Switzerland Eastern, Ukraine, United Kingdom, Latin-America

APPLICATION AREAS:

For products with a “high surface to weight” ratio like leafy salads, spinach, mushrooms, sprouts and flowers, vacuum pre-cooling is perfectly suited. But also, other (more compact) produce like beans, broccoli, celery and sweetcorn, and perishable products like (straw)berries can quickly and efficiently be pre-cooled by using vacuum.

Vegetables and Fresh Produce, Flowers, Food and Bakery Products.

6. Describe the results, achievements and typical failures

HERBS:

- Reducing waste, preserving quality – Almost all herbs can be cooled with vacuum

ICEBERG LETTUCE:

- Extended storage and shipping – No browning of cutting surface

LEAFY LETTUCE:

- Extremely fast cooling possible - Same day delivery & optimized shelf life

RUCCOLA AND SPINACH:

- Ultra-fast cooling preserves your quality – Maximum freshness

BAKERY PRODUCTS:

- You can bring back your cooling time from hours to (3 - 5) minutes! Plus, you save up to 30% on your baking times.
- Better structure, longer crispness, larger volume, less bacteria growth, longer shelf life. For special bread like "Gluten-Free" these advantages are most obvious.
- Saving up to 30% on your baking time, you can increase your baking capacity by up to 40%.
- You can save up to 10% on ingredients, up to 40% on labour costs (no overtime, normal hours, no shift surplus, etc.), up to 60% on space costs and up to 80% on energy bills!
- As your baking and cooling times decrease substantially, you can have your bread ready much quicker. Therefore, you can start production later, giving you and your employees back a normal social life...

7. Summarize what makes the case to a good practice for the members of the SFSCs (e.g. lessons learned)

The innovated vacuum cooling system is a good practice for all partners in the food industry e.g. fresh field produce, fresh vegetables and fruits, bakery products...for developing their cooling technology, thereby reducing the production time, preserving and optimize quality, increase capacity and produce an optimized shelf life of the product.

8. Aspects, methods for transfer of methods for other SFSC members

The vacuum cooling facilities can be set up in all off the local communities e.g. producing, growing and packaging fresh field products, bakery products, perishable products.

9. Recommendations for members of other SFSCs for further applications

Vacuum cooling system can be offered for small businesses, communities where the fast cooling method is a require.

It's not sure, that the individual farmers can take 100% utilization of the system's capacity alone, but in cooperation with the farmers nearby the system is profitable. Collective financing, scheduled operation can be effective for the small businesses. Due the advantage of the mobile equipment costs can be shared, so the technology can be cost-efficient.

Small and high capacity equipment are available.

10. More information is available at (web), if it is relevant

<https://webercooling.com/en/>

Annex

1. Checklist for necessary resources (tangible and non-tangible):

- materials (access to: raw materials/ ingredients - including volume, land – including size, packaging materials)
- human: labour force: size, knowledge & skills (production, technical, marketing, managerial, ICT, financial, etc.)
- technology: patents, know-how, trademarks, copyrights, trade secrets
- infrastructure, equipment, facilities, - size, minimum volume of production/sales, IT infrastructure
- information, reputation, brand, trust
- financial*

*: estimated cost:

0 - 10 000 Eur
10 001 - 50 000 Eur
50 001 - 100 000 Eur
100 001 - 300 000 Eur
300 001 – 1 000 000 Eur
1 000 000 Eur above –

- other specific necessary resources for the application of the specific innovation

2. Checklist for the necessary capabilities

- **food safety:**
 - basic skills to comply with the EU food safety regulations
 - ability to understand what makes the product safe (the key controls, which ensure the safety of the product – biological, chemical and physical hazards, providing the safety shelf life of perishable products)
 - food safety culture (motivation, responsibility for food safety) and basic skills for the implementation of HACCP

- **food quality:**
 - ability to define the target segments of consumers for SFSCs
 - ability to define the product characteristics which are (tacit) basic requirements for the target segment(s) of consumers;
 - ability to define which product attributes/levels and augmented services represent an added value for the target segments of consumers;
 - food quality culture (motivation, responsibility for food quality);
 - production experiences which help to provide the expected quality reliably, uniformly;
 - ability to provide distinguishable quality which meets the needs of the targeted consumer segment;
 - meeting (local) legal requirements, application of the labelling rules;
 - ability to access the consumer willingness to pay for specific products of SFSCs.

- **trust:**
 - ability to ensure product integrity, authenticity and transparent information for the consumers (including systems, tools);
 - ability to access external trust enhancers (third party certification, internal certification system, participatory guarantee systems);
 - application of the labelling rules and branding (mandatory and voluntary);
 - ability to meet third party certification requirements

- **ethical aspects**
 - ability to understand consumer needs for ethical behaviour related to the specific product(s) of the SFSCs;
 - culture for ethical food production and supply;
 - ability to implement necessary measures to ensure ethical food production and supply;
 - ability to access the consumer willingness to pay for products meeting ethical aspects

- **accessibility to consumers:**
 - ability to organize logistics efficiently and to exploit innovative solutions and distribution channels;
 - efficient, innovative sales methods;

- ability to develop and implement new business models for ensuring access of consumers to products and augmented services;
- **fair price:**
 - collecting marketing information;
 - ability to enhance and maintain cooperation among chain actors including the combined use of available complementary resources, capabilities, competences of SFSCs actors, networking, understanding the principles of food value chain management;
 - ability to define, develop or maintain unique quality of products and augmented services;
 - ability to develop and implement new business models;
 - ability to access the consumer willingness to pay for fair price
- **increased negotiation power:**
 - collecting marketing information;
 - ability to enhance and maintain cooperation among chain actors including the combined use of available complementary resources, capabilities, competences of SFSCs actors, networking, understanding the principles of food value chain management, cooperation culture;
 - ability to define, develop or maintain unique quality of products and augmented services;
 - ability to develop and implement new business models;
- **shared use of available resources:**
 - ability to enhance and maintain cooperation among chain actors including the shared and combined use of available complementary resources, capabilities, competences of SFSCs actors, networking, understanding the principles of food value chain management, cooperation culture;
 - the level of value chain management culture;
 - ability to access the consumer willingness to pay for food with reduced environmental impacts

- **input for R+D:**
 - ability to monitor, research, evaluate, and understand the needs and wants of customers and consumers;
 - ability to develop new products, processes, packaging, preservation techniques, systems and access to new markets, including in other categories;
 - access to innovative technologies; distribution and marketing solutions and methods. management systems;
 - access to local input for R+D covered by other aspects

- **access to markets: and market success**
 - effective promotion, customer service, efficient and innovative sales methods;
 - ability to understand consumer's needs;
 - ability to organise logistics efficiently and to exploit innovative solutions and distribution channels,
 - unique value propositions;
 - ability to develop and implement new business models for ensuring access of consumers to products and augmented services, develop the market accessibility for the suppliers.
 - stock control;
 - ability to access to required raw materials within a restricted geographical area

- **access to infrastructure:**
 - ability to use existing own infrastructure in a focused way to serve consumer needs or to combine it with complementary infrastructures of other SFSC actors, cooperation culture;

- **management:**
 - to implement management systems for vision, planning, implementing), coordinating, controlling, monitoring, continuously;
 - improving; ability to motivate, authorize staff;

- **production, processing:**
 - management system, production experience, specific controlling, monitoring, continuously;
 - willingness to consider and ability to evaluate the adoption of TECI and NTI in the current production processes;
 - any additional specific resources necessary for the application of the specific innovation.