SMARTCHAIN
SMART SOLUTIONS IN SHORT FOOD SUPPLY CHAINS

Portable NIR scanner

innovative solutions for Short Food Supply Chains

Campden BRI Hungary

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Template for good practice cases

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

1. **Title of the case description**

   Portable NIR scanner

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):**

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	X	X	X					X	
	food quality	X	X	X	X	X	X	X	X					X	
	trust														
	ethical aspects														
	accessibility														
Needs of the chain actors	fair price														
	increased negotiating power														
	shared use of available resources														
	product development support	X	X	X	X	X	X	X	X					X	
	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**

  Food quality inspection

- **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)**

  Near IR spectroscopic techniques are very useful in evaluating the content of food. This is because 99% of food is made of proteins, carbohydrates, fats and water. NIR provides a means for measuring these components in food. The NIR region contains the absorbance bands mainly due to three chemical bonds which are C-H (as in fats and oils, hydrocarbons), O-H (as in water and alcohol) and N-H (as in Proteins). By measuring the absorption of these chemical bonds which are due to overtones of molecule vibration, one can quantify the amount of the ingredients. Usually, a calibration procedure is needed to relate the absorption spectra to a few samples with a known and varying amount of ingredients. A mathematical relation is then derived which correlates the depth of absorption peaks to the concentration of ingredients. The NIR technique can be applied for food quality inspection in raw and processed meat, dairy products, baked goods, confectionary, grains, oil seeds and beverages.

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

  The NIRvascan™ is the first world portable smart and affordable near infrared spectrometer with integrated tungsten halogen light source build in. It covers many field applications and its configuration is optimized for diffuse reflectance, transmission and fiber input detection.

  Diffuse reflectance is the reflection of light from a surface such that an incident ray is reflected at many angles rather than at just one angle as in the case of specular reflection. Each chemical, substance or material have their own reflectance spectrum. It is a non-evasive and non-destructive technique.

  The NIRvascan™ smart spectrometer is already setup to be used with most Android or iOS devices with Bluetooth, as well as with any computer running

on Windows. With the touch of a finger, you can can now have extensive information on the NIR spectrum of any substance. The data can easily updated to a computer for more complex tasks.

technological ☒ non-technological ☐

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

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

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

Compact & Portable

At only 82.2 x 66 x 45 mm, the device can be easily transported on the field.

Smart

The NIRvaScan™ spectrometer connects to most Android and iOS devices via Bluetooth technology.

Versatile

The device covers transmittance, diffuse reflectance, and optical fiber sensing for spectral ranges between 900 nm and 1,700 nm.

Save

Easily and rapidly save and export your records for further analysis.

PC Analysis

Record and analyze your near-infrared data using the free and intuitive PC software.

Great Sensitivity

The NIRvaScan™ smart spectrometer has a 6000:1 signal to noise ratio for a one-second scan.

- **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)

- human: labour force: size, knowledge & skills (production, technical, marketing, managerial, ICT, financial, etc.)
- technology: patents, know-how, trademarks, copyrights, trade secrets
- financial*

b: List the relevant necessary capabilities for the specific innovation.
Please list the relevant ones only (list is annexed)

- **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.

6. Describe the results, achievements and typical failures

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

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

9. **Recommendations for members of other SFSCs for further applications**

.....

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

https://nirvascan.alliedscientificpro.com/use-of-nir-spectroscopy-for-food-quality-inspection/

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.