

# Biodegradable packaging

## innovative solutions for Short Food Supply Chains

Campden BRI Hungary

December 2019



**Project code: 773785**

**Project acronym: Smart Food Supply Chains**

---

**Internal template:**

**Template for good practice cases**

---

**Work package number: T2**

**WP leader: CBHU**

**Work package title: Technological and non-technological innovations**

**Document issued by:**

**Delivery month:**

**Version:**

**Document language: ENG**

| <b>Dissemination Level</b> |  |  |
|----------------------------|--|--|
| <b>PU</b>                  | <b>Public</b>  |  |
| <b>PP</b>                  | <b>Restricted to other programme participants</b>        |  |
| <b>RE</b>                  | <b>Restricted to a group specified by the consortium</b> |  |
| <b>CO</b>                  | <b>Confidential, only for members of the consortium</b>  |  |

**1. Title of the case description**

Biodegradable packaging

**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<br>(citizens) | food safety                       |                              |   |   | X |   |   |   | X                                | X |    |    | X  |    |    |
|                                      | food quality                      |                              |   |   | X |   |   |   | X                                | X |    |    | X  |    |    |
|                                      | trust                             |                              |   |   | X |   |   |   | X                                | X |    |    | X  |    |    |
|                                      | ethical aspects                   |                              |   |   | X |   |   |   | X                                | X |    |    | X  |    |    |
|                                      | accessibility                     |                              |   |   |   |   |   |   |                                  |   |    |    |    |    |    |
| Needs of the chain actors            | fair price                        |                              |   |   | X |   |   |   | X                                | X |    |    | X  |    |    |
|                                      | increased negotiating power       |                              |   |   |   |   |   |   |                                  |   |    |    |    |    |    |
|                                      | shared use of available resources |                              |   |   |   |   |   |   |                                  |   |    |    |    |    |    |
|                                      | product development support       |                              |   |   | X |   |   |   | X                                | X |    |    | X  |    |    |
|                                      | access to markets and consumers   |                              |   |   | X |   |   |   | X                                | X |    |    | X  |    |    |
|                                      | 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**

The agricultural by-products are a huge pool of untapped biomass resources. The aim of the No-Agricultural Waste (NoAW) project is to turn agricultural waste into resources. This is one of the key elements of a “near-zero-waste-society”.

In the case of the Short Food Supply Chains by the primary production in the agriculture the exploitation of the nascent agricultural by-products for raw material would be practical and useful

- **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 agricultural wastes can be converted into raw material of other products, e.g. can be used as a raw material of green packaging of food products. Bioplastics are not a single material, but a family of materials with different properties. Non-biodegradable, biodegradable, biobased, fossil-based materials are distinguished. Using agricultural by-products (e.g. straw) as a raw material of food packaging from the point of view of economic and ecologic aspects (waste management) are useful as well in the SFSCs.

- **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.**

Currently, several chain processes are being developed in the NoAW project that allow the step conversion of manure and maize silage waste into methane and polyhydroxyalkanoates (PHAs). In one of the steps, these agricultural wastes are fermented into organic acids, which are the ideal building blocks for PHAs production. PHAs are biodegradable polymers with physical and chemical properties similar to conventional plastics, thus being generally called as bioplastics. These bioplastics can be biologically synthesized with mixed microbial cultures fed with the organic acids obtained from the wastes. Typically, these microbial cultures require intensive aeration which can increase the cost of the final PHA product. In the NoAW project, the challenge is to develop a process that uses photosynthetic organisms that instead of aeration can use free sunlight, thus decreasing PHA production costs. With a more competitive price, PHA may find its place in the market and replace

conventional plastics in several applications, like in groceries packaging or in agricultural mulches, leading to more sustainable practices.

Additional aims of the project related to packaging is enzymatic and wet explosion of ligno-cellulosic residues converting lignin into cellulose for better performance,

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.**

Future impacts of NoAW's achievements

- reduction of the effect of global warming
- reduction of plastic pollution
- new income streams
- employment opportunities in rural areas
- inspiration of future generation of farmers, agronomists or food actors to reshape the agro-food supply chains for better profitability and sustainability

Circular economy requires following a more resource-efficient waste valorisation procedure. Consumers pay growing attention to environmental aspects of products and production and climate change. Using innovative packaging technologies can engage consumers, enhance market volume and help to set a fair price.

- **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 (access to: raw materials/ ingredients - including volume, land – including size, packaging materials
    - technology: patents, know-how, trademarks, copyrights, trade secrets
  - 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.

- **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

**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://noaw2020.eu/>

## **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.