

## PDAPP OPERATIONAL GROUP. MOVING TOWARDS A DIGITAL MODEL FOR ZERO WASTE IN THE AGRI- FOOD SECTOR

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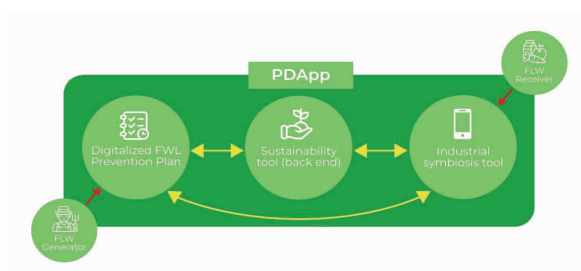
**Abstract:** The PDApp Operational Group (GO PDApp) faces one of the main current challenges in the food chain such as food losses and waste (FLW), with multiple social, environmental and economic consequences. In Europe, the most recent data suggests that 20% of the food produced ends up wasted.

The objective of the project is to reduce FLW in the agricultural sector, particularly the fruit and vegetable sector, through digital tools. Specifically, a decision support service will be designed for companies and agents in this link that will help them prevent FLW. This service includes the necessary support so that they can prepare and digitalize their Plan for the Prevention and Reduction of Food Losses and Waste, a document that is expected to be mandatory in the future.

Work will also be carried out on a digital tool that seeks to allow the exchange of surpluses between generators and possible recipients (processing industry, NGOs receiving donations, livestock industry, feed manufacturers, etc.), guaranteeing traceability and reporting of FLW. to the administrations, aspects that are also expected to become mandatory once the state regulations in this regard are approved. In addition, a precise diagnosis of FLW will be made and awareness of the importance of measuring and reducing FLW will be raised.

**Keywords:** Food waste, FLW, prevention plans, digitalization, industrial symbiosis, Circular Economy.

**GRAPHICAL ABSTRACT**



## INTRODUCTION

Food losses and waste are a global problem that has multiple social, environmental and economic consequences. In 2011, the FAO (Food and Agriculture Organization of the United Nations) noted that one third of the food produced is lost along the food chain (Gustavsson et al., 2011). More recently, the international organization WWF delved into the problem situation in the primary sector, identifying 1.2 billion tons of food wasted worldwide between harvest and post-harvest, which corresponds to 15.3% of foods produced globally (Parfitt et al., 2021; WWF-UK, 2021). In Europe, the most recent data indicates that 20% of food products end up becoming food waste, which represents 129 Mt of wasted food. Of these, 24% and 22% are fruits and vegetables respectively. Furthermore, according to the same report, 41% of fruits and 46% of vegetables available at the beginning of the value chain are discarded as waste in Europe. In the primary sector, 25% of food waste is generated and another 23% is between processing and manufacturing (Caldeira et al., 2019).

This waste has an economic, environmental and social cost. The FAO estimates that the direct economic cost of losses or wasted products worldwide is €1,000 billion per year in economic costs, €700 billion in environmental costs and €900 billion in social costs, for the 1.3 billion tons of wasted food throughout the food chain. Of these figures, the primary sector is responsible for about 8% (Sánchez Cantillo et al., 2019).

Aware of the magnitude of this problem, the United Nations included a specific goal, SDG 12.3, to “By 2030, halve global per capita food waste at retail and consumer level and reduce food losses in production and supply chains, including post-harvest losses.” In the agricultural field, FLW can be divided into: food that is not harvested, and food that is

lost or discarded between harvest and sale at origin. This happens for a multitude of reasons. Some of them are structural to the functioning of the agri-food chain (macro causes) such as marketing standards, price volatility, unfair competition or commercial aesthetic demands due to color, shape, size or ripening or inclement weather or natural conditions. (pests, diseases, etc.), among others. There are also causes intrinsic to the management itself (microcauses), such as poor management in crop management, harvesting or post-harvest, human errors, among others. All these large figures locate the problem globally, but when you go down to the territory, the clarity of the data is blurred, there are hardly any figures available at the Spanish level (Fernandez-Zamudio et al., 2020). Thus, there are still important gaps and progress is needed in a rigorous diagnosis on how to respond to FLW at the link of origin.

The Spanish fruit and vegetable sector has begun to be aware of the problem and try to find alternatives **to reduce and prevent it**. But there is still a lack of concrete tools that can guide the sector's actions to increase its sustainability and competitiveness.

## GOALS

**The main objective is to reduce food losses and waste in the fruit and vegetable sector** through the development of new services supported by digital tools.

To achieve the main objective of PDApp, a work program has been designed based on the deployment of a total of 7 Work Packages (WP) that respond to the 5 Specific Objectives (SO) listed below.

SO1. Diagnose food losses and waste in the fruit and vegetable sector

SO2. Facilitate the implementation of FLW prevention plans in the primary fruit and vegetable sector

SO3. Facilitate decision-making for the prevention of FLW based on sustainability criteria (environmental, social and economic)

SO4. Provide alternatives to prevent fruit and vegetable FLW following the hierarchy of food uses adapted to the sector and the territory.

SO5. Raise awareness and sensitize companies in the fruit and vegetable sector of the importance of reducing FLW and its measurement

## **EXECUTION PROGRAM**

To achieve the main objective of PDApp, a program has been designed based on the deployment of a total of 7 work packages that in turn respond to the 5 specific objectives listed above (Figure 1):

### **WP1. PLATFORM DESIGN AND COORDINATION**

This WP is associated with SO2 and SO4.

On the one hand, the service that the PDApp platform will offer will be designed. This implies considering the operation of both the plan development service and the industrial symbiosis, as well as the requirements and user experience of the fruit and vegetables companies that generate surpluses, the companies potentially receiving them or social guarantee entities. food.

On the other hand, the needs of the sector will be detected (through interviews, visits to companies) to streamline the use of the platform during the start of the service. It will be designed what type of technical personal assistance support the platform needs and what professional profile and skills the person(s) who occupy that professional position must have.

Finally, the technical and economic feasibility study of scaling the PDApp platform

and the search for the business model will be carried out.

### **WP2 CONCEPTUAL DESIGN OF PROTOCOLS TO PREPARE PPRPDA AND PDA MEASUREMENT IN THE HF**

This WP is associated with SO1 and SO2.

Firstly, through interviews and surveys with different companies in the fruit and vegetable sector nationwide, a qualitative evaluation of the different sources of FLW will be carried out based on the main causes of their generation and the critical points in the sector.

Next, both the methodology for quantifying losses and waste will be developed, as well as the protocol to follow for the development of prevention plans.

### **WP3. DEVELOPMENT OF THE SUSTAINABILITY TOOL**

This WP is associated with SO3.

Preparation of the back-end tool for calculating environmental, social and economic impact indicators, following a development line and programming environment compatible with the existing target platform. It is intended that this tool also has a digital signature that validates and allows the information generated to be traced and verified.

This tool must be integrated into the server of the target platform, which will be evaluated through the analysis of the pilots, individual and integration tests, as well as bug fixes and final improvements.

### **WP4. DESIGN OF A DECISION TREE TO STRUCTURE ALTERNATIVES FOR THE PREVENTION AND RECOVERY OF EXISTING FLW**

This WP is associated with SO4.

Based on the review of scientific and

gray literature with alternatives for the prevention and recovery of FLW, a battery of potential industrial symbiosis options will be generated for the fruit and vegetable sector. This information will be used to create a database with companies and entities at the national level that may be both generators and recipients of the FLW generated in the sector.

In addition, surveys will be carried out with interested parties with the aim of detecting the characteristics and conditions for alternatives for the prevention and valorization of FLW following the prevention hierarchy.

Finally, an algorithm will be designed that allows the system to select the destination of the FLW following the hierarchy of use and considering the data obtained in WP2, the results provided by the sustainability tool developed in WP3, as well as the characteristics and conditions for the prevention alternatives detected in this WP.

#### **WP5. DIGITAL DEVELOPMENT OF THE PDAPP PLATFORM**

This WP is associated with SO2, SO3 and SO4

In this WP, the design of both the digitized Plan and the surplus exchange service is carried out. This involves the selection of the programming language, the design of the general structure of the software, and the user experience.

Subsequently, the real application of the application must be simulated by the companies and other participating agents, to validate the development and introduce the necessary adjustments.

#### **WP6. PDAPP PLATFORM VALIDATION**

This WP is associated with SO1, SO2, SO3, SO4 and SO5 and consists of the preparation of FLW prevention plans in pilot cases and the use of the industrial symbiosis service for

FLW prevention, carrying out exchanges with other companies and social entities, as well as the integration of both services on a single platform.

For this, the digital system will be used and there will be dynamic support from a professional to implement the use of the tool in a real environment.

Furthermore, after reviewing the plans, problems or uncertainties will be identified that will be analyzed to determine future innovations for the prevention of FLW.

The quantification of both the number of exchanges and the amount of FLW used, as well as their distribution in the different steps of the priority hierarchy, will be carried out. The strengths and weaknesses and points of improvement for the future of the platform will be jointly evaluated among all the user companies and entities and the promoters.

#### **WP7. DISSEMINATION, COMMUNICATION AND AWARENESS**

The dissemination plan contemplates a series of dissemination actions that take place throughout the execution of the project.

The dissemination activity of the innovation project moves in the territory of “innovation in the agri-food chain” within the fruits and vegetables sector. The priority target audience is farmers, but also the set of supply chain agents, technological partners, administrations and the general public, to communicate the EU’s commitment to innovation and, in particular, convey the objectives of the EIP-AGRI and the commitment of the EU and the Spanish Ministry of Agriculture, Fisheries and Food (MAPA, by its Spanish acronym) to these tools.

A combination of online and offline communication actions has been planned, maximizing the number of impacts in relation to the investment made.

## PARTNERS MEMBERS OF THE OPERATING GROUP AND COLLABORATORS

The PDAPP Operational Group is constituted by the following members: Fundació Espigoladors, as a representative entity, the Technology Centre for Energy and the Environment (CETENMA), as technical coordinator, EnergyLab Technology Center, Oreka Circular Economy, the *Coordinator of Farmers and Livestock Organizations* (COAG), Kiwi Atlántico, Jimbofresh and Conca de la Tordera. Galinsect, Trasdeza Natur, Es Im-Perfect Food, Cooperativa Agrícola Levante Sur, Verdcamp Fruits and Camposeven also participate as collaborating members.

## FUNDING

This project involves a total investment of €599,480.28, and is financed through the Call for subsidies for the execution of innovation projects of general interest by operational groups of the European Association for Innovation in Agricultural Productivity and Sustainability ( AEI-Agri) in 2022, with funds 100% from the EU through the European Agricultural Fund for Rural Development - EAFRD, with the General Directorate of Rural Development, Innovation and Agri-Food Training (DGDRIFA), the managing authority in charge of the application of EAFRD aid.

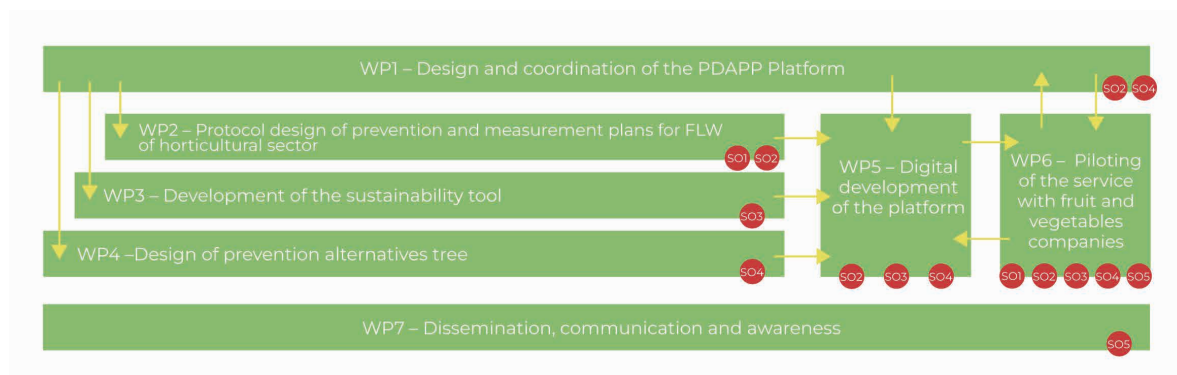


Figure 1. Outline of the project execution schedule

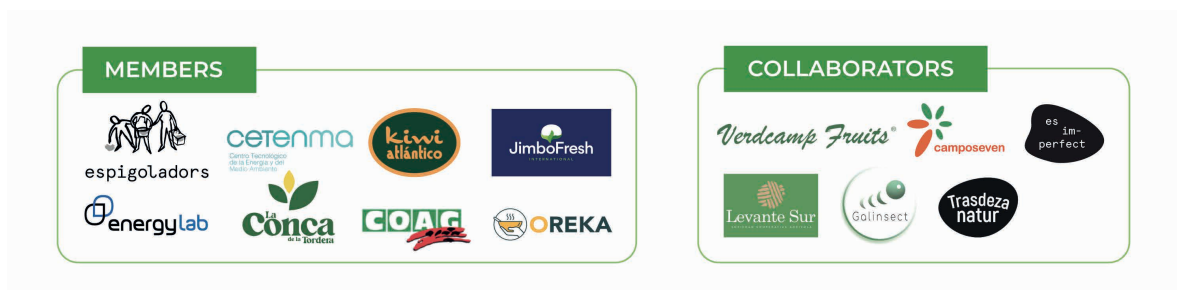


Figure 2. Members and collaborators of the operational group



[https://agriculture.ec.europa.eu/common-agricultural-policy/rural-development\\_es](https://agriculture.ec.europa.eu/common-agricultural-policy/rural-development_es)

Organismo responsable del contenido: Grupo Operativo PDApp. Avanzando hacia un modelo digital para el desperdicio cero en el sector agroalimentario

**Actuación cofinanciada por la Unión Europea**

Europa invierte en las zonas rurales  
INVERSIÓN:  
Total: 599.480,28 €.  
Financiación UE 100% por el Fondo Europeo Agrícola de Desarrollo Rural-FEADER, siendo la Dirección General de Desarrollo Rural, Innovación y Formación Agroalimentaria (DGDRIFA), la autoridad de gestión encargada de la aplicación de la ayuda FEADER.

Figure 3. Funding

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