Layperson's Report

life ecoffeed

New strategies for the coffee by-products recovery as a new raw material for animal feed

The LIFE ECOFFEED project has received funding from the European Union's LIFE Programme.

LIFE19ENV/ES/000186

Index

Context

WHY IS ECOFFEED NECESSARY?

Every year, in the European Union, we consume on average 5 kilograms of coffee per person, generating twice as much coffee by-products. Most of this waste is burned or sent to landfill, causing a major environmental impact.

At the same time, **the livestock sector is looking for more sustainable and cost-effective ingredients for animal diets** to ensure its long-term sustainability, as it is highly dependent on the market for soybean meal and cereal, mostly imported from third countries.

RELEVANT QUANTITATIVE DATA

10 kg

of coffee by-products per person in the EU per year

2 kg

of coffee grounds for each kg of coffee consumed

1 capsule

of coffee generates:

10 g + 3 g

of coffee grounds **of plastic and aluminium**

The Project

MAIN OBJECTIVE

The LIFE ECOFFEED project aims to **develop, demonstrate and implement on a real scale an innovative and sustainable solution** for the recovery of coffee by-products by valorising them as an ingredient for animal feed.

SPECIFIC OBJECTIVES

1. The reduction of coffee grounds from the HORECA channel, currently destined for landfill to produce ingredients for animal feed.

➔ Enhancing the sustainability and competitiveness of the coffee value chain

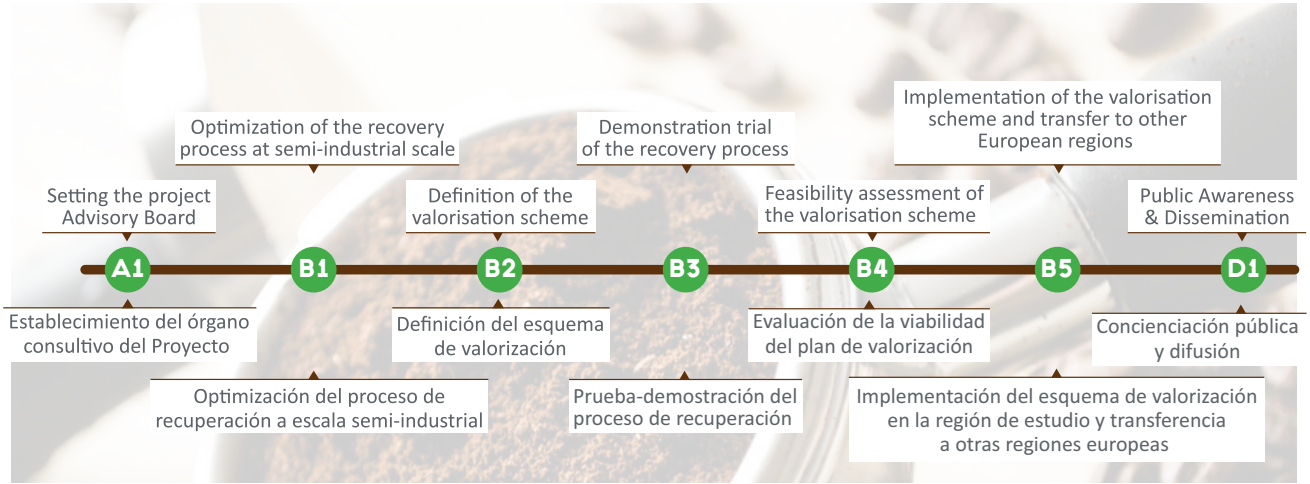
2. To respond to the growing demand for new raw materials for feed production (dairy and sheep).

➔ Increase the sustainability and competitiveness of the feed producing sector by reducing dependence on the current market for raw materials.

3. Reduction of greenhouse gas emissions from livestock due to the beneficial effect on rumen methanogenesis.

➔ Sustainability and social acceptance of livestock farming and its products.

TECHNICAL ACTIONS



The Project

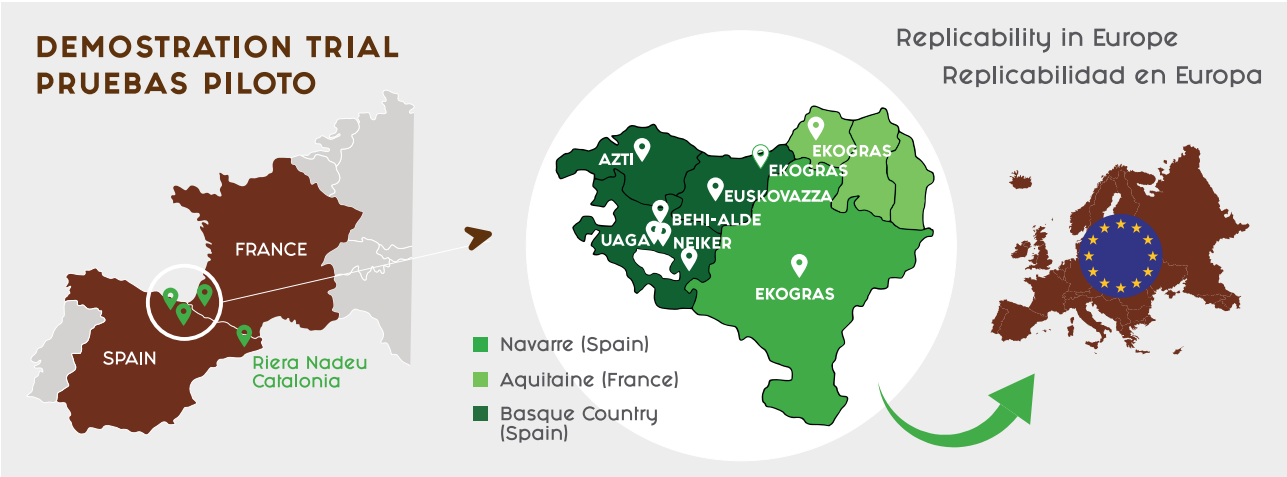
Expected benefits

Increasing the environmental efficiency and competitiveness of the coffee value chain by reducing the final management of coffee grounds in landfills.

Contribution to society's awareness of environmental protection and efficient use of resources.

Increasing the sustainability and competitiveness of the feed sector through **a new sustainable ingredient** from coffee grounds that meets the demand for alternative raw materials.

Increased sustainability and social acceptance of livestock farming by **reducing greenhouse gas emissions** due to the beneficial effect of the inclusion of ingredients from coffee grounds in feed formulation on rumen methanogenesis.



Results

CIRCULAR ECONOMY SOLUTION

The integrated solution for the valorisation of coffee grounds into animal feed comprises the following steps that have been developed and optimised in the context of the LIFE ECOFFEED project:

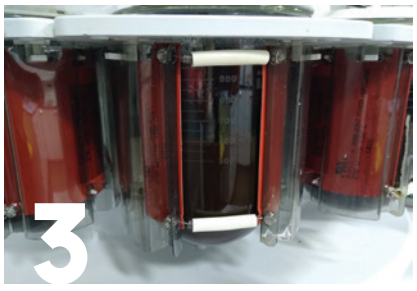
1.Logistics:

Review of legislation on animal feed. A management protocol has been developed for the logistics from its generation in the HORECA channel to the recovery plant by means of didactic sheets and handling courses to prevent cross-contamination and guarantee the hygienic safety and traceability of the by-product.

2. Decapsulation

Optimisation of capsule drying processes for subsequent decapsulation. Improvement of decapsulation processes by means of Crushing technology (crushing and chopping), separation of packaging by vibration and filtration.

- Recovery of the organic fraction for the production of pellets for heat energy.
- Management of the non-organic fraction with recovery of aluminium and plastics.



3. Hydrolysis

Experimental feed trials with hydrolysed coffee grounds as an ingredient in sheep did not show significant improvements. The hydrolysis process introduces an additional expense to the process which is not reflected in improved end product results.

Results

4. Drying

The selected drying technology, Flash Dryer, has been validated for the stabilisation of coffee grounds and for use as an ingredient in animal feed.

5. Characterisation of a new food ingredient from coffee grounds:

The nutritional composition of the ingredient is characterised by its fibre (72.94%), fat (16.36 %), and protein (12.49%) content.
The in vitro digestibility of the organic matter is 26 % due to its high fibre content.

It is also characterised by its antioxidant activity (12.4% trolox equivalents in DM) due to the presence of polyphenols (6.3% gallic acid equivalents in DM). These compounds exert a beneficial effect on the rumen microbiota, promoting more efficient metabolic pathways.

6. Pellet production

It has been concluded that coffee grounds are a suitable raw material for the production of pellets for energy production.

7. Animal trials

The effect of the use of the coffee grounds ingredient in the feeding of ewes and dairy cows has been studied with different degrees of inclusion in the feed (0, 10, 15, 20 % for ewes and 10 % for cows).
. Different characteristics such as apparent digestibility, ruminal fermentation, microbial protein synthesis and methane emissions have been analysed during the trials.

Results

PILOT TESTS
MAIN RESULTS

Main results of feeding trials on 40 ewes fed with different percentages of inclusion of the ingredient obtained from coffee grounds:

- The inclusion of coffee grounds in their different proportions **does not affect the productive yield of the milk.**
- **The physico-chemical quality of the milk produced is maintained** compared to ewes fed with traditional feed.
- **The fatty acid profile of bovine milk is healthier** compared to milk obtained from ewes fed with traditional feed.
- **It reduces enteric methane emissions by 19%** without affecting rumen fermentation.
- **The regular curd consumer is not able to differentiate** curd obtained from milk obtained from ewes fed with feed that integrates coffee grounds from those that have not consumed coffee grounds.

CONCLUSIONS

Up to 20% coffee grounds can be formulated into concentrate for dairy cattle without compromising milk yield and milk composition.

Results

PILOT TESTS
MAIN RESULTS

Main results of feeding trials on 132 dairy cows with feed containing 10% SGC ingredient in the feed formulation:

- **It does not cause changes i**n the yield of cow's milk production.
- **No significant changes in the physico-chemical quality** of the milk obtained.
- **It does not affect the cows' ruminal fermentation** and no changes in methane emissions are observed.

CONSLUSIONS

Coffee grounds can be revalued by including them in milk concentrate with an inclusion of up to 10% without impairing production performance. However, this level of inclusion has not been able to shift rumen fermentation to more energy efficient routes and consequently reduce enteric methane emissions.

Communication

WEBSITE
SOCIAL MEDIA
VIDEO
LEAFLET
ROLL UP

During the project, different communication materials and actions have been developed to raise awareness of LIFE ECOFFEED.

Among the communication materials, a **leaflet** has been designed and distributed in different events, a **roll up** has been used in meetings, presentations and interviews and an explanatory **video** has been published in digital media.

The **website** has been the main platform where all the information related to the project has been published. In the different sections of the menu you can find all the updated information about ECOFFEED and its results. It is especially in the news section where the progress and details of the project have been shared.

In addition to the website, a **twitter profile** (@ECOFFEED) has been created to increase the visibility and awareness of the project. Researchers and partners involved in the project have also shared information about ECOFFEED on their social networks and company communication channels.

Communication

PRESS RELEASES

PUBLICATIONS

On the other hand, **several press release**s have been sent to the media; one at the beginning to present the project and the others throughout the project as progress was made and as relevant information and confirmed results were obtained.

The sending of press releases has been the communication action with the greatest repercussion, as **the media have shown great interest** in the results obtained and there have been multiple interviews on the radio and reports on television and in the printed press.

All the impacts obtained as a result of the press releases are visible and updated on the website in the communication section.

These would be some of the **publications** to highlight:

- FeedInfo 15/12/2020
- ABC Empresa 14/11/2021
- Forum café 23/12/2021
- Barista Magazine 01/12/2022
- Alimarket 16/11/2023

FOAM: NEWS + TRENDS

CAN COWS SOLVE THE PROBLEM OF COFFEE WASTE AND JOIN THE FIGHT AGAINST CLIMATE CHANGE?

WASTE IS, UNFORTUNATELY, a major problem across the coffee industry. Globally, the industry creates an estimated 10 million metric tons of waste in the form of coffee grounds every year. As with food, much of this is "spent." Around 6 million tons of used coffee ends up in landfills. Solutions are needed, and various intrepid minds across the planet are putting their energies into creating them.

Based in the U.K., Bio-Base is turning waste coffee grounds into biofuel, while Belgium's PerssoBurgal is using coffee previously destined for the landfill to grow 2,000 pounds of mushrooms every month. Such initiatives are innovative and enterprising, but they are, as things stand, relatively small ventures. If coffee waste is to be rendered a thing of the past, large-scale, globally applicable solutions will also be required.

To this end, researchers at AZTI, a scientific and technological center based in Basque Country, which straddles the border between France and Spain, believe they may be on the verge of something truly transformative. "Most wet coffee waste is currently being incinerated or disposed of in landfill," says David San Martín, a researcher at AZTI, and the lead mind behind the pioneering Life ECOFFEED project, whose objective is to assess the viability of repurposing coffee waste into cattle feed on an industrial scale. "Despite [coffee waste] having a chemical composition rich in cellulose, hemicelluloses, proteins, fat, polyphenols, or minerals, it is currently being thrown away; it could be used for different applications in a number of industries, such as cosmetic, nutraceutical, and pharmaceutical, or even bioenergy."

In a bid to address the problem, David and his team of researchers set out to determine whether coffee waste could be repurposed as animal feed at scale, something that could conceivably benefit people around the globe. "Livestock plays a crucial economic role for around 60% of rural households in developing countries," says David. "It is one of the fastest-growing sectors in agriculture and offers employment opportunities along numerous animal production value chains."

One of the early hurdles that David and his team encountered was how to turn wet coffee waste, a breeding ground for bacteria and fungi, into a product that would be safe for animals to eat. The answer, he and his team realized, was to find an effective way to rapidly dry the grounds in a sustainable, eco-conscious way. "Many traditional industrial drying processes—rotary drum, fluidized bed, etc.—have been already applied to organic biowaste successfully," David says, "but most studies have pointed out that the associated energy costs limit economic profitability. Optimizing the drying process is of utmost importance. Flash-drying technology is emerging as one of the most effective options. The heat transmitted from hot air to particles is very efficient, and subsequently, the residence time of wet coffee grounds inside the equipment is very short."

Making the drying process energy efficient and fast is a challenge that, David readily admits, has not been completely overcome quite

Dissemination

SCIENTIFIC ARTICLE

As far as the scientific community is concerned, one scientific article has been published in Open Access: *Coffee Grounds' Nutritional Value as an Ingredient for Ruminants'* Diets. Animals 2023, 13, 1477.

CONFERENCES AND EVENTS

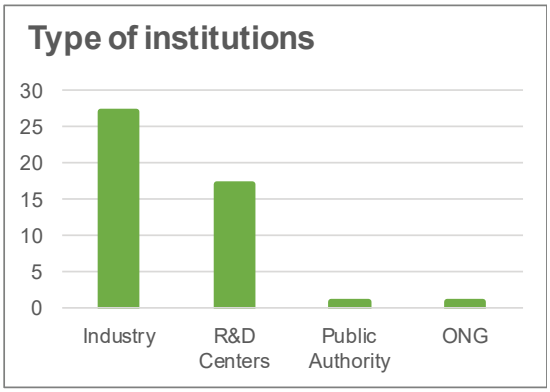
Project partners have also participated in national and international events:

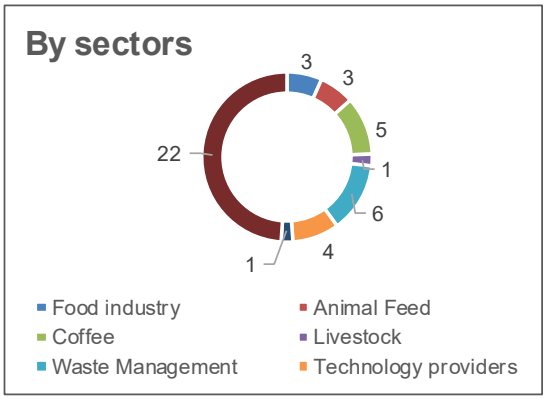
- Jornadas de Producción Animal, 2023, Zaragoza
- Conama 2021, Madrid
- Food4Future 2021, Bilbao
- International Conference on Sustainable Solid Waste Management (SSWM) 2022, Corfu. Greece
- Circular Economy Conference, 2022, Vitoria City Council
- Conama 2022, Madrid
- Digital Coffee Future. Coffee Pricing and Technology Summit.
- European Federation of Animal Science, , Annual Meeting 2022.
- International Conference on Sustainable Solid Waste Management (SSWM) 2023, Chania. Greece

Dissemination

NETWORKING WORSHOPS MEETINGS WITH STAKEHOLDERS

A collaborative network has been created with related projects, companies in the sector, research centres, NGOs and administrations to create synergies and share information. A **total of 49 networking activities** have been carried out. Below you can see these activities by type of centre, country, sector and area of interest.





A workshop was also held as part of the eighth edition of the World Rural Forum: VIII GLOBAL CONFERENCE. FAMILY FARMING: SUSTAINABILITY OF OUR PLANET.

Project Impact

IN NUMBERS

Following the above-mentioned communication actions, the project has had a considerable impact. Below are some relevant quantitative data that help to get an idea of the reach achieved.

/ 9

PRESENTATIONS AT

CONFERENCES AND EVENTS

Training Workshops

During the World Rural Forum, the LIFE ECOFFEED solution was presented to around 100 stakeholders: representatives of various governments, livestock and agricultural organisations, international organisations (such as FAO and IFAD), National Committees for Family Farming, rural development associations, NGOs, cooperatives and research centres from the five continents. It is worth highlighting the interest shown by the participants in applying the solution in other regions with similar characteristics.

/ 900

PAGE VIEWS ON THE WEBSITE

/ 13,500

TWITTER **IMPRESSIONS**

/ 3’23”

AVERAGE TIME ON WEB PER SESSION

/ 49

NETWORKING ACTIVITIES

/ 13Millones

ESTIMATED NUMBER OF PEOPLE REACHED THROUGH **PRESS RELEASES**

/ 112

INTERESTED **STACKEHOLDERS**

“

The cows were attracted by the smell of coffee, they like it. The milk produced has the same quality parameters as the other herds.

It is good to diversify raw materials and have alternatives.

GORKA BERRIO,
LIVESTOCK FARMER IN BEHIALDE

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