

What is BREAD4PLA project about?

BREAD4PLA is a European project to demonstrate the technical viability of the process for obtaining a biodegradable plastic material, i.e polylactic acid (PLA), using as raw materials by-products from the bakery industry. The obtained PLA will be used in the production of new biodegradable packages for bakery products, closing the shelf life. This demonstration is at pilot plant scale. Many biodegradable plastics are produced from renewable sources like crops (wheat, sugar beet, sugar cane, potatoes, ...), leading to social and political discussions due to the destination of human food to this purpose. BREAD4PLA is a solution to this problem, as the raw materials to produce the biodegradable plastics are by-products of the bakery industry, which are usually addressed to animal feeding. The by-products are valorized through this project by means of their recovery, attending to an additional environmental problem like their current inadequate management.

The bakery by-products can lead to lactic acid by fermentation and enzymatic processes. In a second step, the lactic acid is polymerized into polylactic acid (PLA) that can be processed by the current extrusion techniques to obtain biodegradable films.

The project, coordinated by AIMPLAS, is three years long and the first tasks have already started: selection, characterization and treatment of the by-products from the bakery industry. In the next months, the work will be focused on the obtaining of lactic acid from the selected by-products.

The project consortium is formed by the following specialized centers:

- _CETECE: Technological Institute of Cereals in Palencia, Spain
- _ATB: Agricultural Institute in Postdam, Germany
- _BC: Biocomposites Centre in Bangor, United Kingdom
- _AIMPLAS: Technological Institute of Plastic in Valencia, Spain

Coordinating Beneficiary:



Associated Beneficiaries:



About the LIFE Programme

LIFE is the EU's financial instrument supporting environmental and nature conservation projects throughout the EU, as well as in some candidate, acceding and neighbouring countries. Since 1992, LIFE has co-financed some 3506 projects, contributing approximately €2.5 billion to the protection of the environment.

Source:

<http://ec.europa.eu/environment/life/>

The LIFE programme covers two main sectors: Nature & Biodiversity and Environment. There are different sub-sectors within the Environmental Section of LIFE programme, like Air, Energy & Climate, Environmental management, Industry & Production, Urban Environment & Quality of life, Soil, land use & agriculture, Waste and Water. In the waste sub-sector,

LIFE projects play an important role in developing and testing solutions to specific technological challenges, particularly with regard to waste treatment in the manufacturing sector. Integrated methods for better waste management, awareness-raising campaigns, better ways of using resources and treating waste are just some of the issues addressed by LIFE.

BREAD4PLA project belongs to the waste sub-sector of the programme (Project grant agreement: LIFE+ 10ENV/ES 479).



20th Anniversary - LIFE contest

The LIFE programme celebrates its 20th anniversary in May 2012. To mark this important milestone in the history of the EU's financial instrument for the environment, the LIFE unit invites all LIFE projects to take part in TWO special competitions: The LIFE Photo Competition and the LIFE 20 words Competition.

BREAD4PLA project participates in both competitions, with the following contents:

Text contest:

- Leading demonstrative project in plastic packaging
- Innovation in bakery industry
- Food waste as raw material. Competitive cost.
- Environmental global solution

Photo contest:



Kick-off meeting of BREAD4PLA in Valencia

The kick-off meeting of the project took place last 25th October 2011 at AIMPLAS facilities in Valencia, Spain. During the meeting, the project consortium agreed the different actions to start with the collection and selection of the sub-products of the bakery industry, their characterization and the

establishment of a protocol to manage the waste samples. In addition, different dissemination activities were planned for the next months.

The next project meeting will be held in May, at CETECE facilities in Palencia, Spain.



The project website – Already available!

The website of BREAD4PLA project is already available through the link www.bread4pla-life.eu.

Up-dated information about the project can be found on the website. In addition, the website offers to visitors a Technological Watching Service with up-dated news, articles, patents and forthcoming

events regarding PLA packaging. A specific FORUM has been created for the participation of those people interested in the project and issues related to PLA packaging. Different topics can be discussed, facilitating the exchange of information, questions, concerns, etc. We encourage you to participate in the Forum!



BREAD4PLA dissemination in the media

BREAD4PLA dissemination in the media has showed a great impact, at least for the moment, in Spain. As a result of the 1st press release publication in Spanish, initially at regional level: several interviews were arranged in on-line media, and afterwards, their replication up to national level were immediate and outstanding.

This fact has demonstrated that Spanish society and media are interested in the project topic since its beginning, which is indeed good news. The BREAD4PLA consortium hopes to have similar level of impact in the press releases to be published in UK and Germany, and of course, through all the other dissemination activities foreseen.



BREAD4PLA in different events

AIMPLAS has participated actively in different big events related with packaging and plastic materials. A stand was set up to attend to the visitors, and



EMPACK 2011, Madrid
The 4th edition of this specialized and professional packaging event was held on the 26th and 27th October 2011 in Madrid, Spain.

ATB also participated actively in several dissemination activities like BIOREL2012 (Industrial Use of Renewable Raw Materials: Chemistry, Biotechnology, Process Engineering) celebrated on the 14th and 15th February 2012 in Frankfurt. The symposium targeted experts from

different projects were disseminated, including BREAD4PLA project. The project was disseminated using a notice board and project leaflets.



EQUIPLAST 2011 EXHIBITION, Barcelona
BREAD4PLA was present at the 16th edition of EQUIPLAST in Barcelona. This event was held in November, and it is one of the most important exhibitions about Plastics and Rubber in Europe.

industrial and academic research, who are involved in the chemical use of renewable resources. Innovative solutions for raw material production, biomass treatment and process engineering along the value chain were presented.

The project in ECOFIRA Innovation

ECOFIRA INNOVACION in this year was celebrated from 29th February until 2nd March in Valencia, Spain. ECOFIRA 2012 is made up as a big showcase for last innovations and steps forward in the field of environmental solutions. In 2008, there were created the ECOFIRA INNOVACION PRIZES, recognizing the most innovative projects. An exhibition place for the selected innovations is provided during the event celebration as their inclusion in the digital catalogue in the ECOFIRA website.

The winners were announced last 22nd February. Unfortunately, BREAD4PLA was not chosen as the three best eco-innovations. In fact, although BREAD4PLA shows a really interesting pre-competitive and innovative idea to be commercialized,

there were other relevant factors during the selection procedure with important weight as well, such as the project status (i.e. those projects in their last stage or even finished obtained higher scores). However, the BREAD4PLA consortium is determined to re-submit the project as the best eco-innovation opportunity by 2014 edition, when it is foreseen that the biodegradable packaging products are already available, meaning that our chances to get a prize will be much higher.



Bakery waste production and its applications on bioresources

The food processing industry generates annually a great quantity of waste that is not taken advantage or is in use for animal feed or other different purposes. The food industry by-products constitute a serious waste problem in many countries due to the environmental pollution they generate.

In the EU between 118 and 138 million tonnes of bio-waste are produced every year.

The bakery industry is one of the world's major food industries and varies widely in terms of production scale and process. The western European bread industry produces 25 million tonnes of bread per annum, of which the industrial or plant sector's share is 8 million tonnes. Germany and the UK are the main operators with 60% of plant sector production. France, the Netherlands and Spain produce another 20 % among them.

Bakery solid waste includes stale bakery products, dropped raw materials (e.g., dough), and packaging. The most simple and common way is to transport it to landfill or incineration. Landfill can cause the waste to decompose, which eventually leads to production of methane (a greenhouse gas) and groundwater pollution (organic compounds).

Incineration of bakery waste can also release nitrogen oxide gases. Reclamation of the bakery waste can play an important role in its management. The solid waste from baked

bread (about 175 thousand tons of bakery waste in Europe) can not be re-processed and generally it is used for animal feeding or eliminated by landfill or incineration processes. The waste consists primarily of stale bread, bread rolls, and cookies. Its main application is animals fed, such as swine and cattle, in combination with other fed components (proteins, fibres, vitamins, fat...) with higher nutrient value. In despite of the fact that this represents an environmental friendly recycling way for this waste, economically it represents a very low added-value option.

Other option is to use this waste for production of valuable products. Carbohydrates like starch, which is the main constituent of the bread dry weight, are preferably used as substrates/nutrients for several biotechnological (fermentation) processes. However this application consumes a very low percentage of this type of waste. A piece of bread contains approximately 50% of starch, 40% of water and 7% of protein, but bread crust contains starch at 70%.



Fig. 1 Bread and plastic

	Million Kg.		Million €	
	Total	Per capita	Total	Per capita
Total bread	1710,16	37,39	4307,27	94,18
Fresh frozen Bread	1483,42	33,44	3672,89	80,31
Fresh whole Bread	91,49	2	229,81	5,02
Fresh Bread	1377,56	30,12	3412,92	74,63
Fresh Bread without salt	14,37	0,31	30,16	0,66
Industrial Fresh Bread	226,74	4,96	634,39	8,5
Industrial Whole Bread	23,33	0,51	47,27	1,03
Industrial Bread	109,01	2,38	227,2	4,97
Industrial without crust Bread	27,62	0,6	114,23	2,5

Table 1. Bread consumption at home in Spain in 2009.

However, this waste represents an important source of energy to produce high added-value products, such as chemical precursors for the synthesis of biopolymer materials.

The bioplastic is a polymer of natural origin, derived from starch, cellulose, soybean oil, maize, etc. and is produced by a living organism and biodegradable nature.

Approximately half of the total lactic acid consumed in the world is produced by fermentation of carbohydrates by lactic acid bacteria. To supply the increasing demand for lactic acid, more economical materials such as starch hydrolysates, whey and molasses have been evaluated to reduce the production.

Nowadays industrial installations to produce lactic acid are based on the use of food raw materials. Getting lactic acid of waste from the baking industry could close the life cycle of the packaging products of these

same companies with a bioplastic derived from waste industry itself.

Generally the waste will be provided by large processing companies of bakery products (such as Panrico and Siro, in Spain) since small firms are crafts bakers and do not generate an important waste production volume to obtain the return of bioplastics with lactic acid base.

In general terms, bioplastics will grow at a significant pace over the next 5 years. The total worldwide use of bioplastics was valued at 571,712 metric tons in 2010. This usage is expected to grow at a 41.4% compound annual growth rate (CAGR) from 2010 through 2015, to reach 3,230,660 metric tons in 2015. To do research and invest in bioplastics is a not only a market trend, but an option at long-term to contribute in some way with the current sustainability and environmental policies.

	Starch Based Polymers *	Polylactic Acid (PLA)	Others **	Total
North America	9	32	3	44
Europe	64	12	9	85
Japan	1	5	4	10
Other Asia	n/a	23	n/a	30
Total	>74	72	>16	169
% of Total	45,80%	44,30%	9,90%	100%

Table 2. World consumption of biodegradable polymers by type 2009 (thousand of metrics tons).

* Includes material that is predominantly starch, as well as polycaprolactone starch compositions.

** Includes cellulosics, polyvinyl alcohol (PVOH), polyhydroxyalkanoates (PHA), Polyhydroxybutyrate (PHB) and petrochemical derived Polyesters and Polycaprolactone (PCL).

Top companies of bakery fresh and dry	
Enterprise	Sales (thousand euros)
Panrico Group	650
Bimbo Group (Sara Lee Bakery Group)	450
Europastry	360
Siro Group	264
Fanasa Group	223,84

■ CETECE article

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News

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