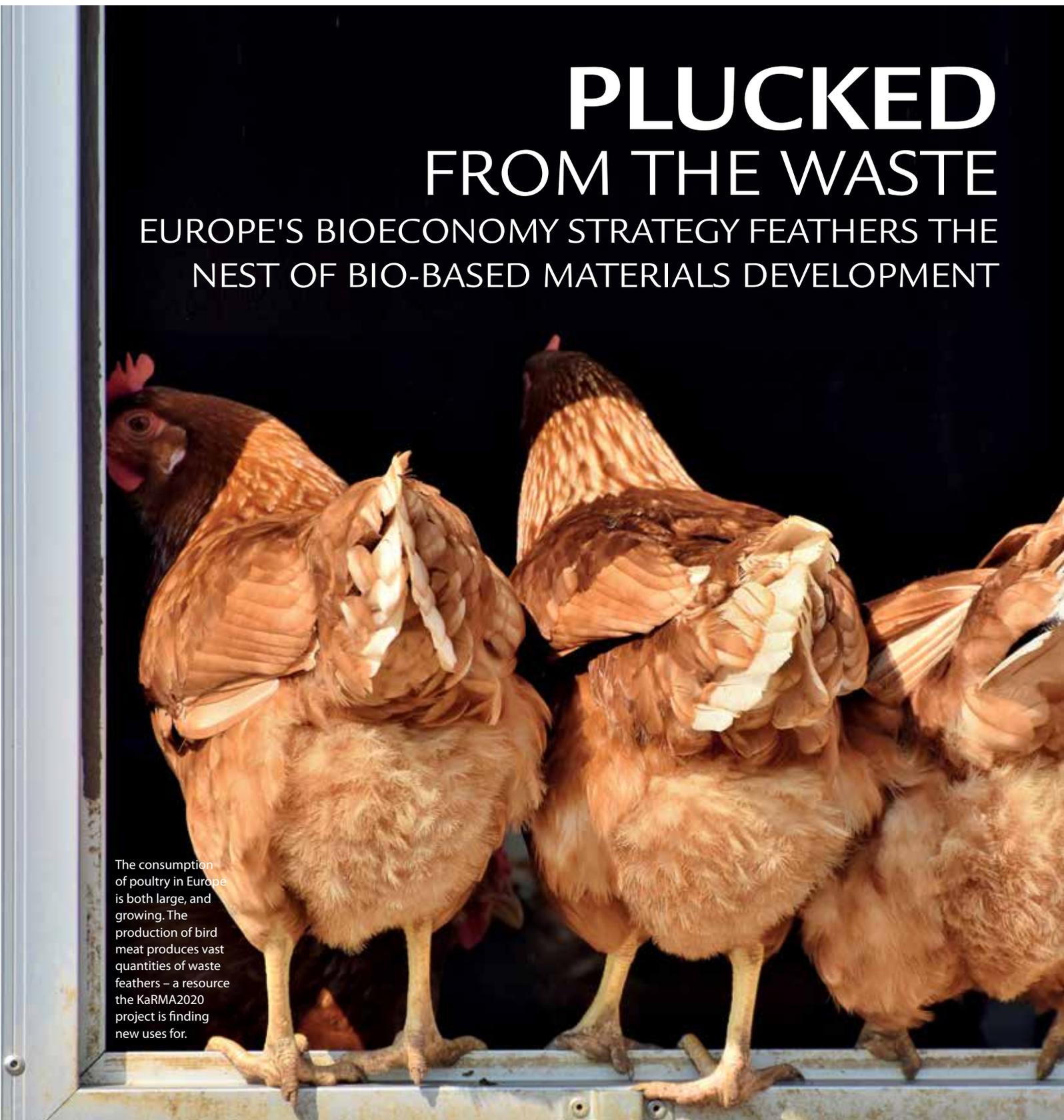


# PLUCKED FROM THE WASTE

EUROPE'S BIOECONOMY STRATEGY FEATHERS THE  
NEST OF BIO-BASED MATERIALS DEVELOPMENT



The consumption of poultry in Europe is both large, and growing. The production of bird meat produces vast quantities of waste feathers – a resource the KaRMA2020 project is finding new uses for.



With the aim of reducing the reliance on fossil-based materials, the European Commission launched and adopted Europe's Bioeconomy Strategy in 2012, which addressed the production of renewable biological resources and their conversion into vital products and bio-energy.

By Ine De Vilder

**I**n view of the world's limited and diminishing fossil resources, which are nearing the probable peak of their exploitation, and the huge environmental challenges brought about by them, finding innovative bio-based alternatives is a key issue for ensuring the viability of the future European society. With the aim of facing these challenges, the European Commission launched and adopted Europe's Bioeconomy Strategy in 2012, which addressed the production of renewable biological resources and their conversion into vital products and bio-energy.

Aligned with this strategy, converting alternative feedstocks into conventional raw materials has attracted increased interest over recent years, contributing to the creation of a new paradigm.

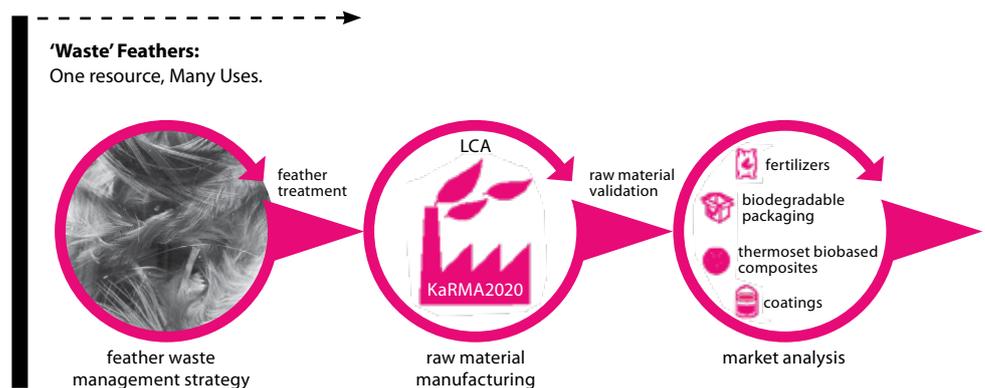
One of these alternative feedstocks is feathers, typically a waste product of the poultry industry and generated in huge quantities each year. In the European Union alone 13.1 million tonnes of poultry are produced per year, with an esti-

mated 3.1 million tonnes of feather waste being generated. Due to the increase in poultry meat consumption in EU countries, this quantity is expected to increase in the coming years.

Current management practices for this abundant waste stream include conversion into animal feed, composting, incineration or landfill disposal. However, all of these processes have a low added value, and some raise environmental concerns related to their final disposal.

In this context, the KaRMA2020 project, funded in the framework of Horizon 2020 (SPIRE-03-2016), was launched on 1 January 2017 for a period of three years. It is aimed at the industrial manufacture and exploitation of sustainable raw materials from feather waste to develop innovative green products for high impact cross-sectorial markets.

Within the project, the feather waste stream generated at the poultry slaughterhouse has been valorised using different technologies adapted to the final use of feathers. The feather-derived raw materials





## KARMA2020 TECHNOLOGIES

- Steam explosion process
- Deep eutectic solvent fractionation
- Bioprocessing of feathers
- Hot melt extrusion
- Flame retardants
- Thermoset resins

have then been used to manufacture bio-based products, which can replace fossil-based materials. The initial lab-scale experiments have been replaced by pilot and industrial demonstrations, end products validation and feasibility studies to ensure the roll-out of the innovative technologies.

## KARMA2020 FANS ITS TAIL AT ECOMONDO

The project was recently presented at the Ecomondo trade show in Rimini, Italy, where CiaoTech organised the KARMA2020 innovative workshop *From feather waste to market opportunities for bio-based plastics, fertilisers, flame retardants and technical coatings*, which was held on 5 November. During the workshop, many stakeholders interested in the project gathered to understand how it is possible to exploit underutilised feather waste at industrial level for the production of valuable raw materials to develop products for cross-sectorial applications. Representatives from KARMA2020 also took the opportunity to communicate the latest progress and results achieved within the project.

Moreover, KARMA2020 was also presented in two sessions: a poster presentation during *The management of industrial waste: critical and potential of Italian system by a comparison with other European countries* and an oral presentation during *Innovative solutions of waste prevention and management: operational and assessment*

*tools*. More information was also available in the CiaoTech booth.

## FLYING TO THE FINISH

The KARMA2020 project is about to finish in 2019; one of its major achievements is the creation of a range of raw materials derived from feathers, which have been used for the manufacturing and validation of fertilisers, packaging trays, composites and technical coated textiles. Depending on the end product, the reduction in the use of fossil sources ranges from 30 to 100%. These KARMA2020 products will guarantee their bio-based content through the corresponding OK Bio-based certification.

After a number of public health crises in the past, such as avian flu and bovine spongiform encephalopathy, waste from the poultry industry was classified as a hazardous waste that is costly and difficult to manage. The current alternatives to incineration or safe disposal of the feathers in landfills, such as rendering for animal food, are of very low profitability.

The KARMA2020 technologies will provide the greatest uplift for the EU poultry industry in years. A cheap, concentrated source of biomass will be used to create bio-products of high added value instead of becoming an environmental concern. However, the environmental benefits don't stop there. The new value chains are reinforcing the circular economy concept: feathers are treated to be either upcycled in new technical cycles (textiles, thermoset resins, etc.) or returned to the biogenic cycles as fertilisers. This is a win-win for the industry and the environment.

Besides these new developments, the environmental impact of the technologies, processes and materials of the project are being evaluated to lower their carbon footprint. In conjunction with this assessment, KARMA2020 has developed an integrated waste management strategy which covers waste generation along the whole value chain of the project and the potential valorisation routes.

It is expected that the KARMA2020 developments will reach the market in the coming years, generating new business opportunities and providing a second life for this feather waste. —

## BENEFITS OF KARMA2020 TECHNOLOGIES

The valorisation of the current waste, in conjunction with the technological breakthroughs proposed in KARMA2020, guarantees significant benefits from both an environmental and economic point of view. Due to the innovation potential of KARMA2020, the project will have the following relevant impacts:

- **Technical impact**, by optimising feather processing methods from laboratory to industrial scale
- **Industrial impact**, by manufacturing bio-based raw materials and by producing and validating end products
- **Environmental impact**, by reducing the negative environmental effect of the feather waste and by replacing non-renewable primary raw materials with renewable raw materials for industrial production
- **Economic impact**, by promoting innovative applications and higher-value products from current waste.