

## The sunliquid® bioethanol plant: Advanced biofuels en route to commercialization

In the EU, about 225 million tons of waste and residues are produced every year. Converting these residues into biofuels can cover up to 16% of the forecasted fuel consumption in road transportation in 2030. Agricultural residues alone account for around 139 million tons. Assuming the conservative estimate that about one-third of the straw should remain on the fields to ensure soil quality and another third is needed for other applications, the remaining third is available for biofuel production.\*

Clariant's innovative sunliquid® technology can be used to produce cellulosic ethanol, an advanced biofuel, from these agricultural residues in a cost-effective and energy-efficient way. Clariant has been working on the development and commercialization of this technology since 2006.

### Launch 2006

Development of highly specialized microorganisms and enzymes on laboratory scale.



### Pilot plant in Munich 2009

Pilot-scale development of the biotechnological and process engineering fundamentals of the sunliquid® technology at Clariant's Biotech Center in Munich. The technology has been optimized for various types of feedstock.



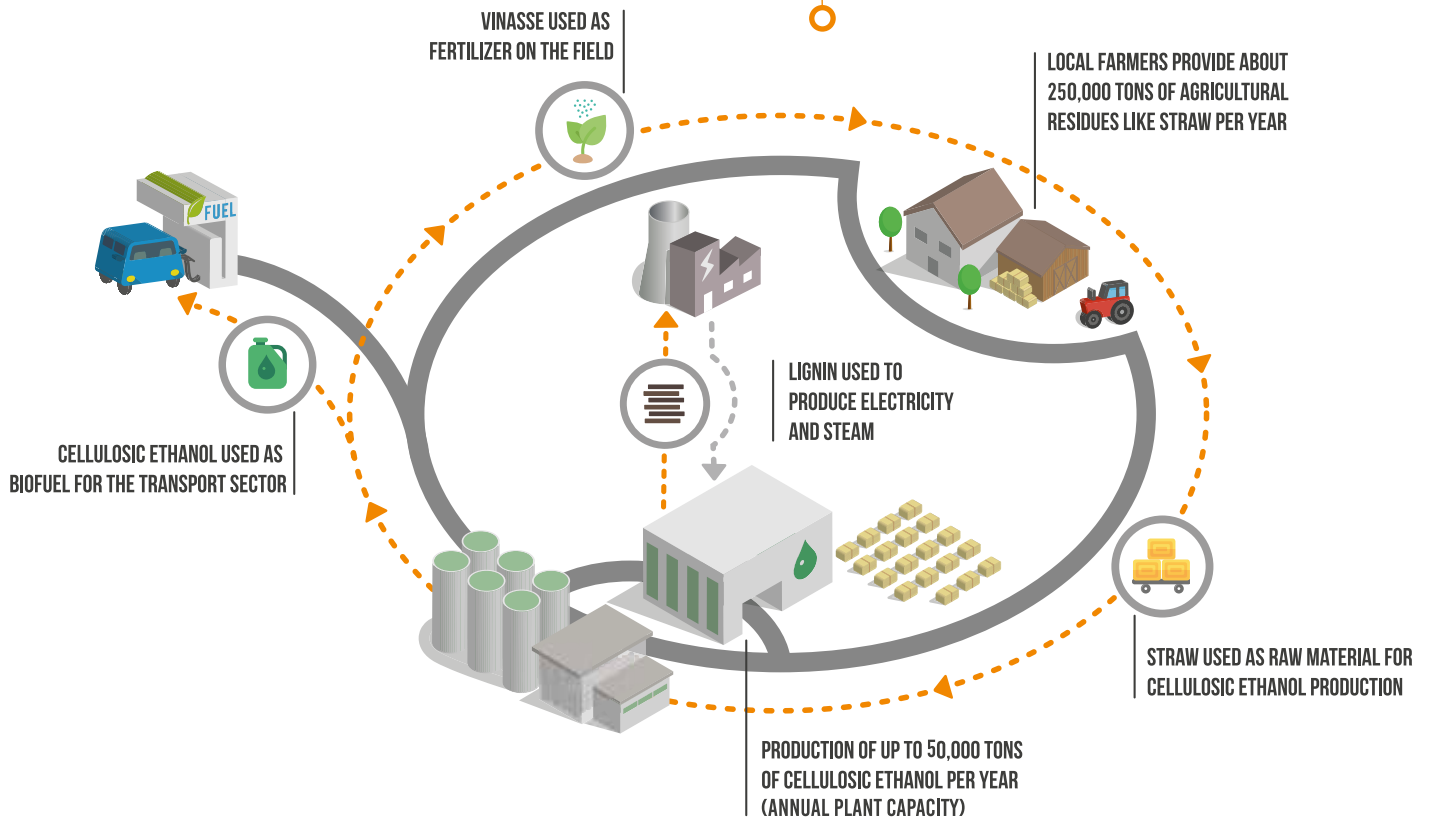
### Demonstration plant in Straubing 2012

The entire production process for cellulosic ethanol using the sunliquid® technology has been tested on an industrial scale. Up to 1,000 tons of cellulosic ethanol can be produced here annually. The plant was ISCC-certified in September 2013.

\*Source: Wasted – Europe's Untapped Resource, ICCT  
<https://theicct.org/publications/wasted-europes-untapped-resource>



# First commercial-scale plant for the production of cellulosic ethanol in Podari in Southwestern Romania



## The sunliquid® bioethanol plant – facts and figures



### Feedstock

- Use of currently underutilized agricultural residues
- Annual conversion of around 250,000 tons of local straw into cellulosic ethanol
- Additional source of income for the agricultural sector



### Production capacity

- Approximately 50,000 tons of cellulosic ethanol annually (annual plant capacity)
- Corresponds to up to 5% of the annual ethanol demand in Germany<sup>1</sup>
- For comparison: with one ton of pure ethanol a car can travel for around 15,000 km



### Jobs

- Creation of green jobs in predominantly rural areas
- Inside the plant: around 100 full-time employees
- Outside the plant (field/logistics): around 300 persons
- Boost of local economies and creation of additional business opportunities



### Benefits for the environment

- Establishment of an energy self-sufficient, highly sustainable production process for cellulosic ethanol by using co-products for the production of regenerative energy and as fertilizer
- Greenhouse gas emission savings of up to 95%
- No need for additional arable land
- Creation of a sustainable and competitive source of domestic renewable energy in the EU
- Support of the transformation from a fossil-based economy to a bio-based, circular economy

<sup>1</sup> Demand for bioethanol to be blended into gasoline was just under 1.1 million tons in 2020 (<https://www.bdbe.de/daten/marktdaten-deutschland>)