



Promoting the penetration of agrobiomass heating in European rural areas

Agrobiomass in the European context



CERTH
CENTRE FOR
RESEARCH & TECHNOLOGY
HELLAS

**The Clinic Workshop on waste-to-energy
solutions for municipalities**



WECOOP
EU – Central Asia Cooperation on
Water – Environment – Climate Change

Online

7 April 2022



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 818369. This document reflects only the author's view. The European Climate Infrastructure and Environment Executive Agency (CINEA) is not responsible for any use that may be made of the information it contains.

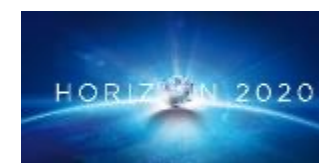
- **CERTH:** established in 2000 and is currently among top-20 EU research institutions with the highest participation in competitive research grants (Horizon 2020) / No1 in Greece
- **CERTH:** legal entity governed by private law with non-profit status, supervised by the General Secretariat for Research and Innovation (GSRI) of the Greek Ministry of Development & Investments
- **CPERI:** one of CERTH's five institutes, established in its current form in 2012
- **Personnel:** 1,100+ (CERTH) / 250+ (CPERI) – mostly engineers and scientists
- **Turnover:** 40 mil. € (CERTH) / > 13 mil. € (CPERI, 2019) – mostly from competitive projects & industrial contracts
- **Offices:** 6 regions and 7 cities in Greece - Thessaloniki, Ptolemaida, Athens, Rhodes, Ioannina, Volos, Piraeus
- **Main thematic areas:** climate change, sustainable energy, artificial intelligence, advanced robotics, Internet of Things, holistic approaches to healthcare and nutrition, autonomous vehicles, smart cities of the future and circular economy



Thessaloniki Headquarters



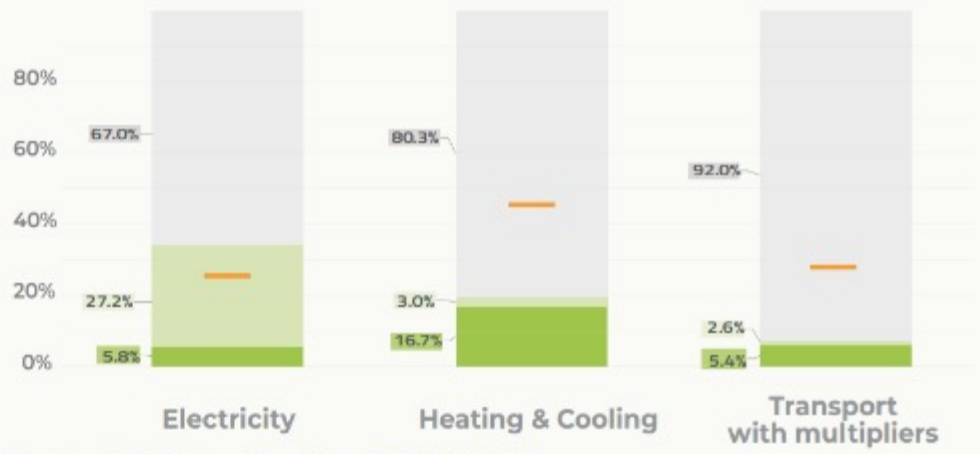
New Ptolemaida Installations



- (Agro)biomass overview
 - Definition, potential, current use, cost-effectiveness
- The AgroBioHeat project
 - Objective, consortium, activities
- Some thoughts on Central Asia prospects for agrobiomass...

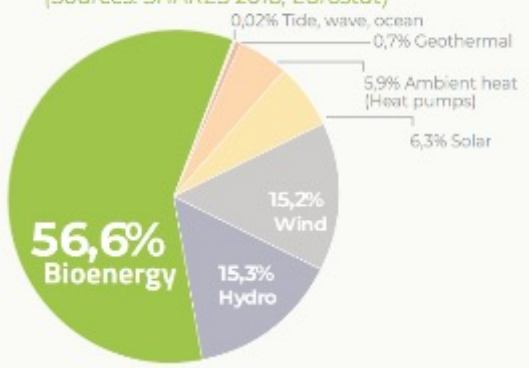
Agrobiomass overview

Repartition by energy source for the different final usages in the EU28 in 2018 and their relative importance in the total final energy consumption (%)
(Source: SHARES 2018, Eurostat)



Note: Calculated in accordance to the methodology established in Directive 2009/28/EC and Regulation (EC) No 1099/2008.
For the energy source repartition in transport 'Other renewables' represents RES electricity used in transport which also counts towards the RES for electricity (not for the sector share in total final energy consumption). Multipliers included.

Distribution of renewable gross final energy consumption in the EU28 in 2018 (%)
(Sources: SHARES 2018, Eurostat)



Distribution of the different biomass feedstock for energy in 2018 (%)
(Sources: Eurostat and Bioenergy Europe's estimates)

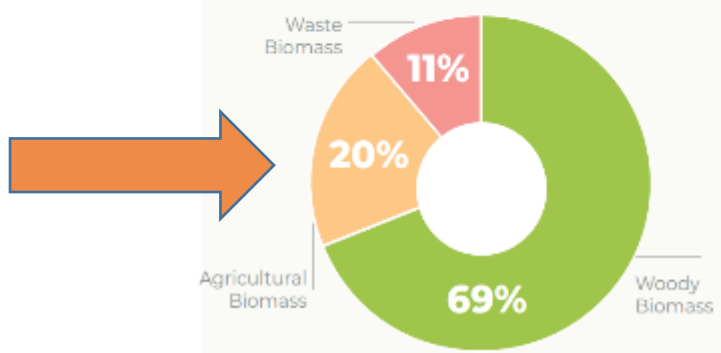


Image Sources: Bioenergy Europe Statistical Report 2020

Agricultural residues

- Herbaceous: straw, maize residues
- Woody: agricultural prunings, orchard plantation removals



Large potential: 1 ton of an agricultural product → ~ 1 ton of agricultural residues

Agro-industrial residues

- Olive stones / olive cake, nut shells, sunflower husk, rice husk, peach kernels, cotton ginning residues and others



No harvesting required, often low moisture / good calorific value, very competitive fuel sources

Perennial energy crops

- Herbaceous: miscanthus, switchgrass, etc.
- Woody / Short Rotation Coppice: poplar, willow, etc.

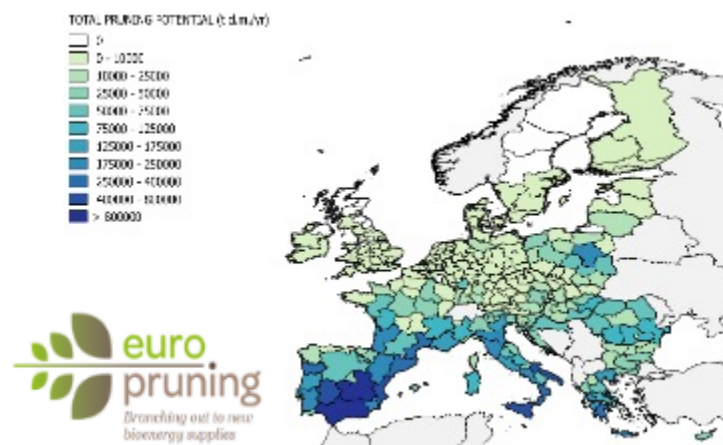
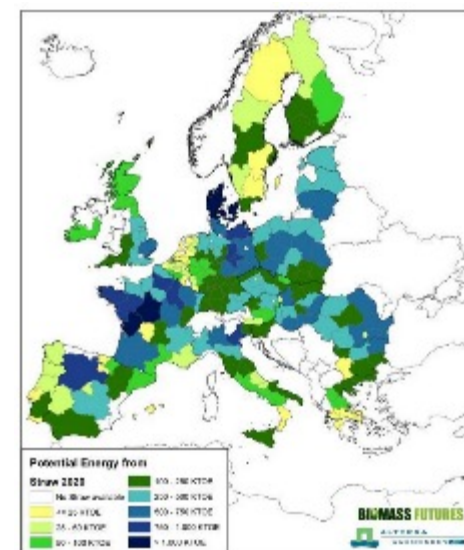


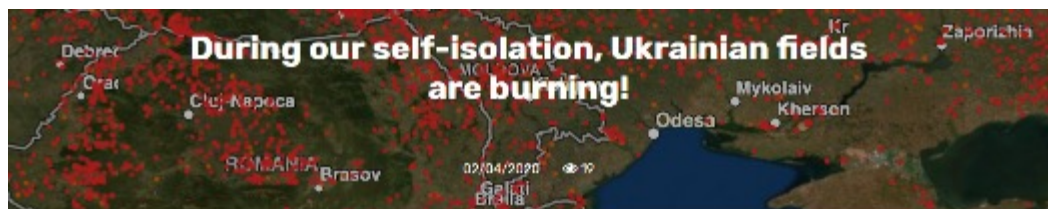
Higher yields, cultivation on abandoned, marginal, or contaminated land, eco-system services, etc.

- **Herbaceous agricultural residues:** 168 Mt dry, technical potential / 123.5 Mt dry sustainable potential
- **Agricultural prunings:** 12.5 Mt dry, technical potential
- **Agro-industrial residues:** not insignificant quantities available on the market, e.g. 1.2 Mt of exhausted olive cake just in Spain
- **Perennial energy crops:** around 118,480 hectares in EU28 (0.07 % of Utilized Agricultural Area), primarily with miscanthus, poplar and willow

References for agrobiomass potential:

- Herbaceous agricultural residues: Scarlat et al., 2019
- Agricultural prunings: Dyjakon & García-Galindo, 2019
- Agro-industrial residues: Manzanares et al., 2017
- Energy crops: Bioenergy Europe Statistical Report 2020





Although on-field burning of stubble, straw is officially forbidden, it remains a culturally entrenched stereotype that has terrible consequences. It harms humans, animals, the ecosystem as a whole.

Screenshots of NASA fire map. Information from the last 7 days.



There are more fires per unit area in Ukraine than in Poland, Slovakia, Belarus, Hungary and other European countries.



The impact of stubble burning and poor air quality in India during the time of COVID-19

27 Jul 2020 | [The Daily News](#) | [The Daily News](#) | [The Daily News](#)

A holistic approach by government and farmers alike is needed to address the problem of burning crop stubble, which comes at a huge environmental and health cost



As the world grapples with a respiratory disease like the Coronavirus, it is important to remember the further respiratory distress that awaits crops in fields under the impact of air pollution caused by annual stubble burning.

Image Sources: [NASA FIRMS System](#) / [UABIO Newsletter](#) (April 2020) / bottom right – [The Energy and Resources Institute](#) (India)



Image Sources: [top – AGROinLOG project Greek demo video](#) / bottom left – M. Karampinis / bottom right - Facebook

National success case of straw in Denmark

- Straw in Denmark: 2.25 % of gross energy consumption and 10.2 % of RES production (2018)
- Energy applications include farm heating, DH systems, CHP and large-scale power generation
- Examples of replication on local / regional scale can be found in other European countries



Images: right - Strudstrup Power Station, Denmark (Source: Torben Skøtt, Biopress) / left - St. Merlose Heating Plant, Denmark (Source: Linka)

Local / regional markets for agro-industrial residues

- Mediterranean countries: olive stones and exhausted olive cake / Eastern Europe: sunflower husk (pellets) / several other: nut shells, cotton ginning residues, peach stones, etc.
- Self-consumption by producing industries (e.g. olive pomace mills, vegetable oil industries) for process heat
- Leftover quantities are made available to the market for wide range of applications depending on properties: domestic heating, greenhouses, industrial heat, CHP / power production



Images: CERTH

- Usually initiated by pioneers with a vision for local agrobiomass utilization
- Agrobiomass mobilization typically ranges from a few hundred to a few thousand tons per year per initiative
- Different models: agrobiomass pellets / briquettes for market, self-consumption for heat, greenhouses, small district heating systems, small power plants
- May serve as inspirations for similar initiatives...
- ...but still not widespread models



Vioenergiaki Patridas (Veria, Greece): 1 MWe gasifier using wood chips from peach tree plantation removals. Image source: M. Karampinis



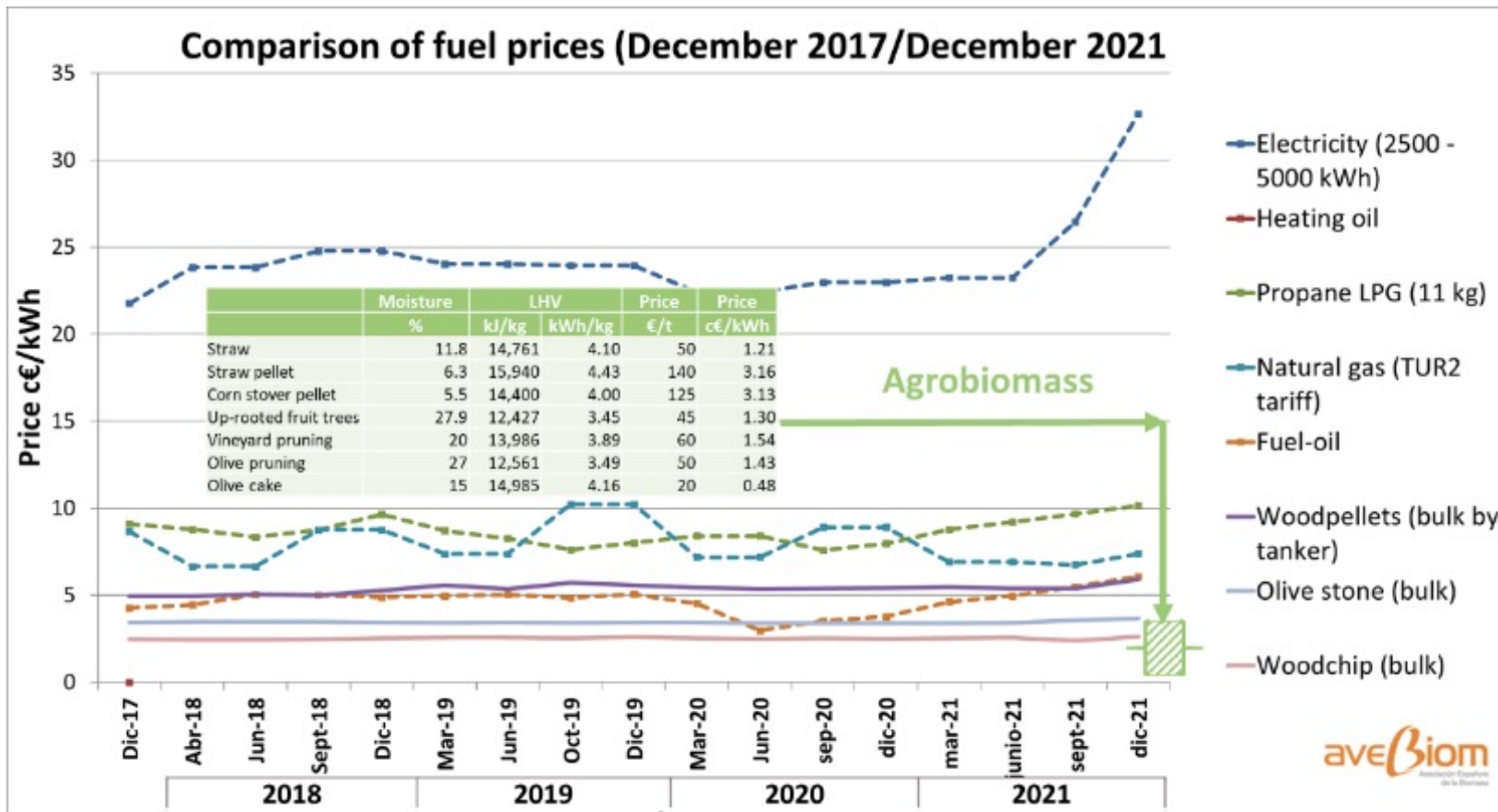
AgroTherm GmbH (Malchin, Germany): 800 kW boiler using fen biomass from paludiculture for district heating. More info: [BOnaMoor project](https://bonamoorproject.org/)



“La Girada” (Vilafranca del Penedès, Spain): 500 kW boiler fueled with vineyard prunings for municipal district heating. Image source: [Vineyards4heat project](https://vineyards4heatproject.org/)



FIUSIS (Calimera, Italy): world's first 1 MWe biomass power plant fueled exclusively by olive tree prunings. Image source: Fiusis Srl Facebook page



- The final heating cost depends on the efficiency of the installation
- The exploitation of “alternative” biomass fuels can lead to low heating costs- however, appropriate technologies are needed to deal with their challenges

| Socio-Economic Benefits | Environmental Benefits |
|--|--|
| Income / activity diversification for farmers | Reduction of air emissions from avoidance of open field burning of residues |
| Local job creation and socio-economic development | Reduction of GHG emissions from substitution of fossil fuels |
| Self-sufficiency (reduced reliance on imported fossil fuels) | For lignocellulosic crops: phytoremediation, improvement of soil quality, carbon sequestration, water quality and biodiversity |
| Triggers new forms of agro-industrial integration | |

| Challenges | Solutions |
|---|---|
| Dispersed resource, harvesting costs | Development of local supply chains with appropriate technical implements |
| “Challenging” fuel properties (e.g. ash, alkalis, etc.) | Use of appropriate, modern technologies |
| Low priority of residue management for farmers | Introduction of suitable policy instruments (e.g. incentives for treatment) |
| Low priority / lack of awareness for policy makers, farmers, etc. | Knowledge transfer, dissemination, promotion of success cases |

AgroBioHeat project and activities

Overall aim: support European rural decarbonisation through market uptake of agrobiomass heating solutions

- Funding: Horizon 2020, Grant Agreement 818369
- Granting Authority: European Climate, Infrastructure and Environment Executive Agency (CINEA)
- Topic: LC-SC3-RES-28-2018-2019-2020 - Market Uptake support
- Duration: 1st January 2019 – 30th June 2022
- Total budget / EU funding: 2,998,043.75 € / 2,998,043.75 €
- Project Coordinator: Centre for Research and Technology Hellas (Greece)
- Website: <http://www.agrobioheat.eu>

Technical partners



European Association



National multipliers



Straw & network expertise Operator of biomass heating plants Social sciences expertise



Vilafranca del Penedès (ES) – 27th February 2020



- Workshop on using vineyard prunings for heat / energy production
- Site-visit to “La Girada” district heating of local municipality, fueled exclusively with vineyard prunings / 500 kW Heizomat boiler



- Site-visit to Familia Torres / 2.6 MW biomass boiler coupled with adsorption chiller for cooling / fueled by forest wood chips and vineyard prunings
- Further information:
<https://agrobioheat.eu/vilafranca-del-penedes-visit/>



AgroBioHeat

Virtual Site-visit to
Agrobioheat facilities
in Romania

Friday
April 29, 2022

Start From
10:00 AM CET

More Info:
www.greencluster.ro

Organized by
GREEN ENERGY
Romanian Innovative Biomass
CLUSTER

AgroBioHeat in rural areas

Agro-Industry facilities

[Register](#)

QR code

The project received financing from the Horizon 2020 EU Framework Programme for Research and Innovation under Grant Agreement No 818369

- Register at this link: <https://forms.gle/JtUpjPX3Dqh47tfh9>
- Further information: <https://agrobioheat.eu/romanian-virtual-visit/>



AgroBioHeat in Romania – Virtual site-visit 29 April 2022

Registration form: <https://forms.gle/PQ59Cx4mzaTQ7Nvk8>

Preliminary agenda

| Time (CET) | Topic |
|---|--|
| 09:50 – 10:00 | Connecting to Zoom |
| 10:00 – 10:20 | Welcome & Scope of the meeting AgroBioHeat project in Romania |
| 1st part of the Site-visit: Agrobiomass heating at (agro)industrial facilities and office buildings | |
| 10:20 – 10:40 | <ul style="list-style-type: none"> Dalia company – greenhouse Bertis company – food processing Solfarm company – agroindustry Business Incubator – office building |
| 10:40 – 10:50 | Q&A session |
| 10:50 – 11:00 | Small and medium scale heating systems |
| 2nd part of the Site-visit: Agrobiomass heating in rural areas / small municipalities | |
| 11:00 – 11:20 | <ul style="list-style-type: none"> Ghelinta – Bioenergy village Estelnic - Bioenergy village Locodeni village – LIA Foundation Sfantu Gheorghe – TEGA company |
| 11:20 – 11:30 | Q&A session |
| End of the site-visit | |

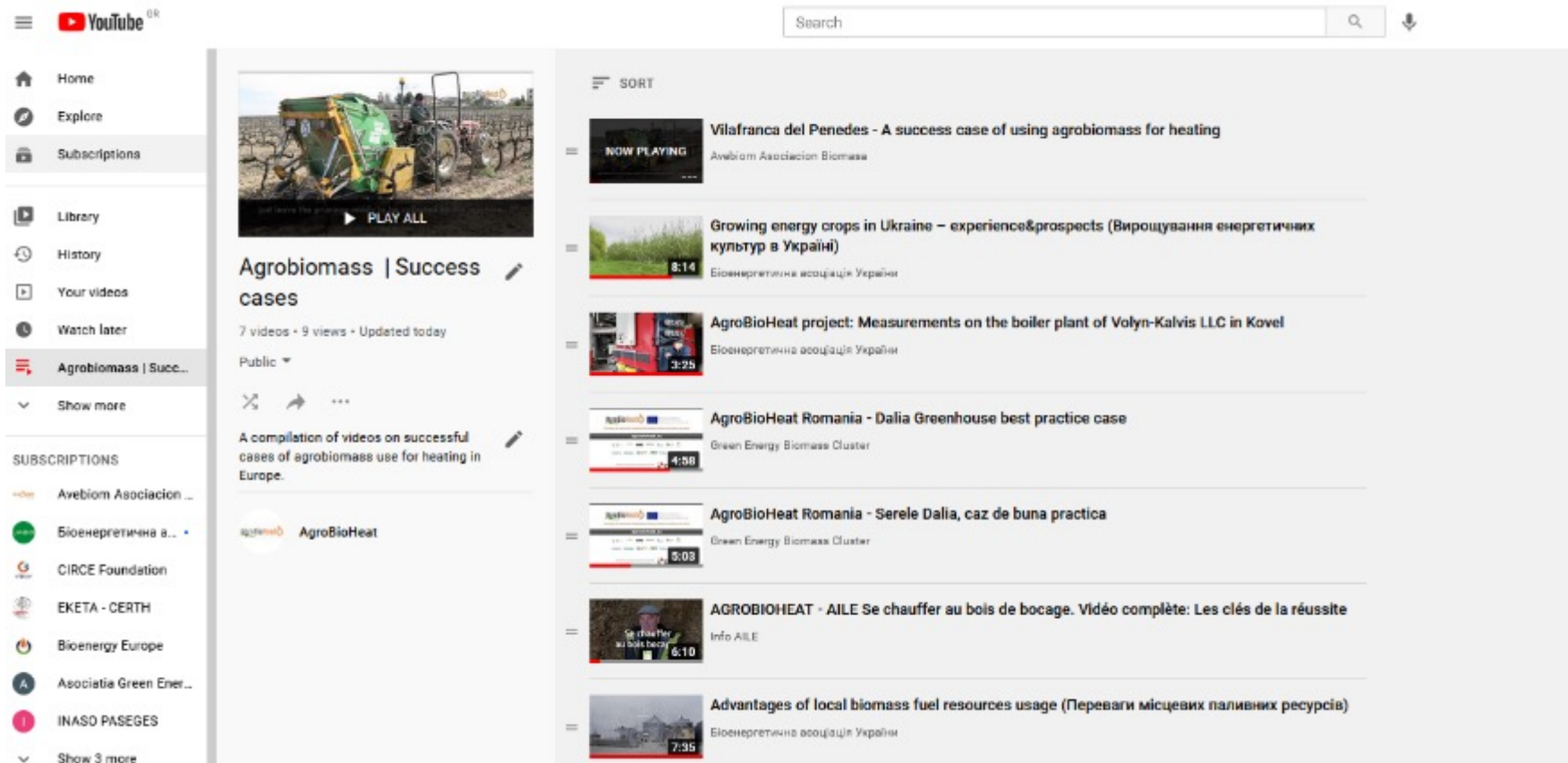
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Europene Horizon 2020 în baza Acordului de Finanțare nr. 818369

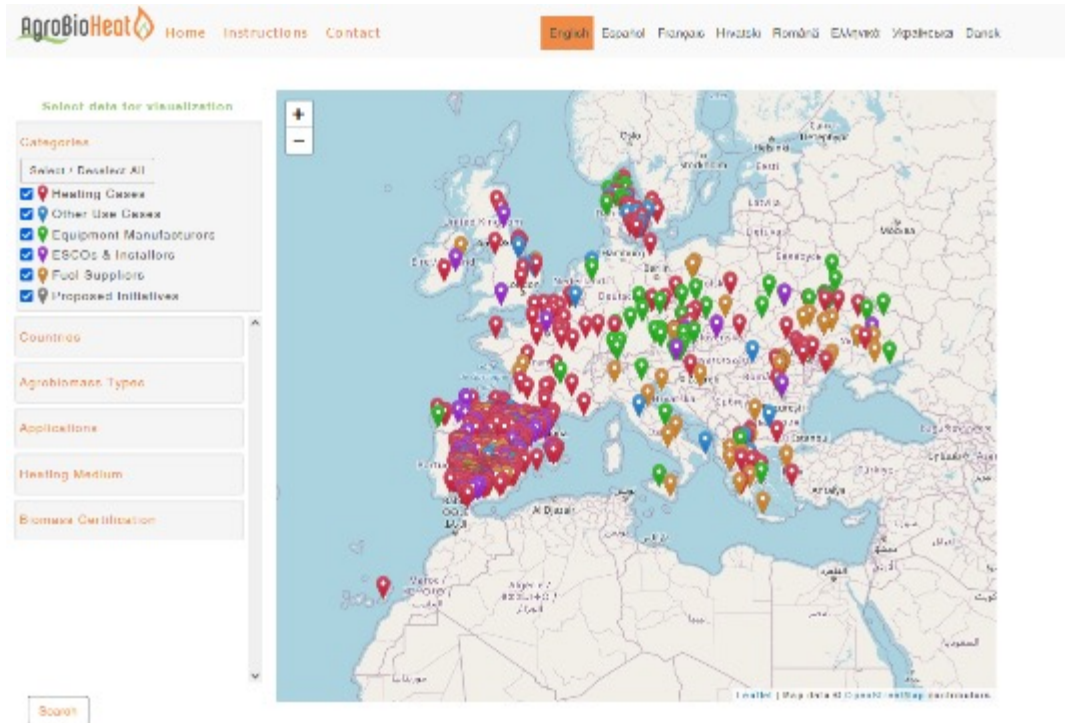


The screenshot shows a YouTube interface with a playlist titled "Agrobiomass | Success cases". The playlist contains 7 videos with a total of 9 views, updated today. The videos are public and are sorted by "NOW PLAYING". The video thumbnails and titles are as follows:

- Vilafranca del Penedes - A success case of using agrobiomass for heating** (Avebiom Asociacion Biomasa)
- Growing energy crops in Ukraine – experience&prospects (Вирощування енергетичних культур в Україні)** (Біоенергетична асоціація України)
- AgroBioHeat project: Measurements on the boiler plant of Volyn-Kalvis LLC in Kovel** (Біоенергетична асоціація України)
- AgroBioHeat Romania - Dalia Greenhouse best practice case** (Green Energy Biomass Cluster)
- AgroBioHeat Romania - Serele Dalia, caz de buna practica** (Green Energy Biomass Cluster)
- AGROBIOHEAT - AILE Se chauffer au bois de boccage. Vidéo complète: Les clés de la réussite** (Info AILE)
- Advantages of local biomass fuel resources usage (Переваги місцевих паливних ресурсів)** (Біоенергетична асоціація України)

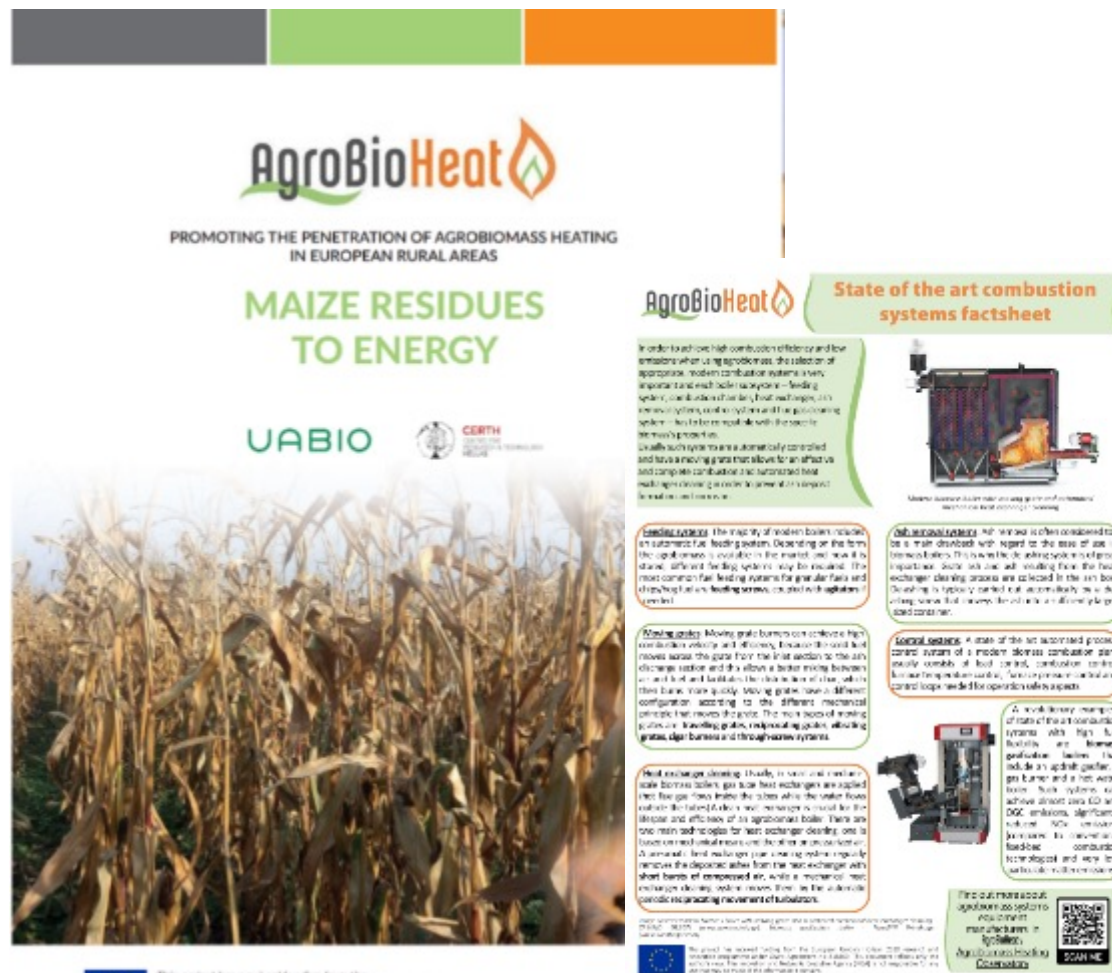
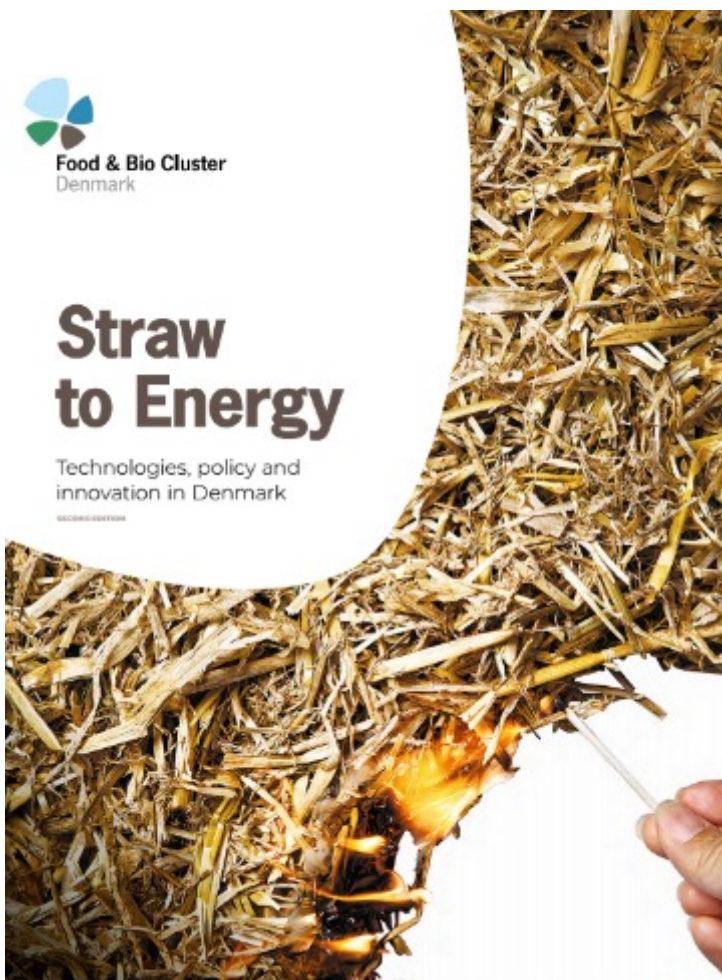
- Further information:
https://www.youtube.com/playlist?list=PL1_oLIJqXCaCMYnofIAdRm63RmlobWgE-

www.agrobiomass-observatory.eu



- 680 agrobiomass heating cases (thermal output < 50 MW)
- 51 other cases of agrobiomass use (power, CHP, large-scale heat, etc.)
- 67 equipment manufacturers (boilers, flue gas cleaning systems, others)
- 113 ESCOs & Installers
- 114 agrobiomass fuel suppliers

Continuously updated!



<https://agrobioheat.eu/agrobiomass-guides/>
<https://agrobioheat.eu/agrobiomass-factsheets/>

+ Agro-industrial residues to Energy Guide & Agricultural prunings to Energy Guide in the making...



Virtual event - 3rd edition

Bringing VALUE to AGROBIOMASS

WEBINAR on April 20th · 2022 # 10:00 - 12:00 CET

MATCHMAKING on May 11th · 2022 # 09:00 - 16:00 CET

  This project has received funding from the European Union's Horizon H2020 research and innovation programme under Grant Agreement No. 818369

Participation is FREE

Register at this link: <https://bringing-value-to-agrobiomass-3.b2match.io>



Virtual matchmaking event

Bringing VALUE to AGROBIOMASS

February, 10 - 11 · 2021

Participation is FREE

  This project has received funding from the European Union's Horizon H2020 research and innovation programme under Grant Agreement No. 818369



Virtual matchmaking event

Bringing VALUE to AGROBIOMASS

November, 3 - 4 · 2021

Participation is FREE

  This project has received funding from the European Union's Horizon H2020 research and innovation programme under Grant Agreement No. 818369



WBA Webinar Series – Agricultural Residues

Webinar 2: National experiences on feedstock mobilization, policies and regulations

28th January 2020 // 11.00 – 12.30 CET

Greening Energy in Rural Areas Through the Valorisation of Agricultural Residues
11 June 2021 | 10:00–11:30 CEST (Online)

| | | | | | | | |
|---|--|---|--|---|---|---|---|
|  Olaf Neuberg Senior Policy Manager AgroBioHeat |  Barbara Polyzou Sales Director AgroBioHeat |  David Rankin Regional Manager AgroBioHeat |  Isabel Parkes Policy Officer European Project AgroBioHeat |  Marios Karamanolis AgroBioHeat Project Coordinator AgroBioHeat |  Jerome Mallat Research Director AgroBioHeat |  Tajana Budak Head of AgroBioHeat European Project AgroBioHeat |  Wolfgang Wolf Research Director European Project AgroBioHeat |
|---|--|---|--|---|---|---|---|

AgroBioHeat    

BIOHEAT WEBINAR 2021

Βιοθερμότητα: Η ανανεώσιμη και ανταγωνιστική λύση παραγωγής θερμότητας από τον οικιακό τομέα μέχρι τη βιομηχανία

Παρασκευή
24/09/2021
16.00 – 18.00

Διαδικτυακή
Εκδήλωση

Διατίθεται
BIOENERGYNEWS

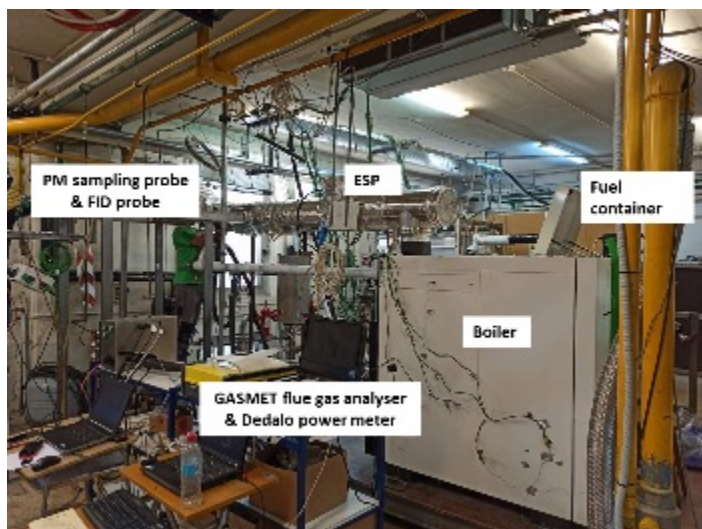
Panel Discussion - Enabling Factors to Successfully Develop and Deploy a Bioenergy Project in Rural Communities

28 February 2022 | 17:00–18:00 CET (Online)

Indicative events – further information available on the project website: <https://agrobioheat.eu/news-events/>

Recordings on AgroBioHeat YouTube channel:

https://www.youtube.com/playlist?list=PL1_oLIJqXCaB7mQPA3dQicHWvIBYJ2rCf



- Test runs according to EN 303-5 by project partners BIOS, CERTH, CIRCE + DTI (as external contractor)
- Wide range of agrobiomass fuels used (olive stones, olive & vineyard pruning pellets, sunflower husk pellets, wheat straw pellets, miscanthus, SRC chips, agropellets, etc.)
- Modern combustion technologies tested (moving grate boilers coupled with ESPs, updraft gasifiers)
- First results already published at EUBCE 2021 proceedings: [Brunner et al. \(2021\) Assessment of Agrobiomass Combustion in State-of-The-Art Residential Boilers, DOI: 10.5071/29thEUBCE2021-2AO.5.1](#)
- Recommendations on suitable agrobiomass emissions limits for upcoming review of [Commission Regulation \(EU\) 2015/1189](#) following consultations with boiler manufacturers
- Field measurements at operating facilities also organized & planned





- Croatia – new agrobiomass fuels from olive oil residues
- France – new, local initiatives using miscanthus, hedgerow prunings and other fuels
- Greece – heating of municipal buildings with vineyard prunings
- And others...
- Romania – heating of agro-industrial and villages
- Spain – heating initiatives with fruit tree prunings
- Ukraine – heating of commercial buildings with reed biomass / heating of schools with sunflower husk pellets

Some thoughts on Central Asia prosepcts for agrobiomass...

- Huge area, large percentage of population leaving in rural areas
- Several relevant cultivations and related agrobiomass assortments: wheat → straw, fruit and nut trees → prunings, cotton → cotton stalks
- The development of small-scale agrobiomass value chains can support the decarbonisation of rural, agricultural Central Asian communities in a cost-effective way

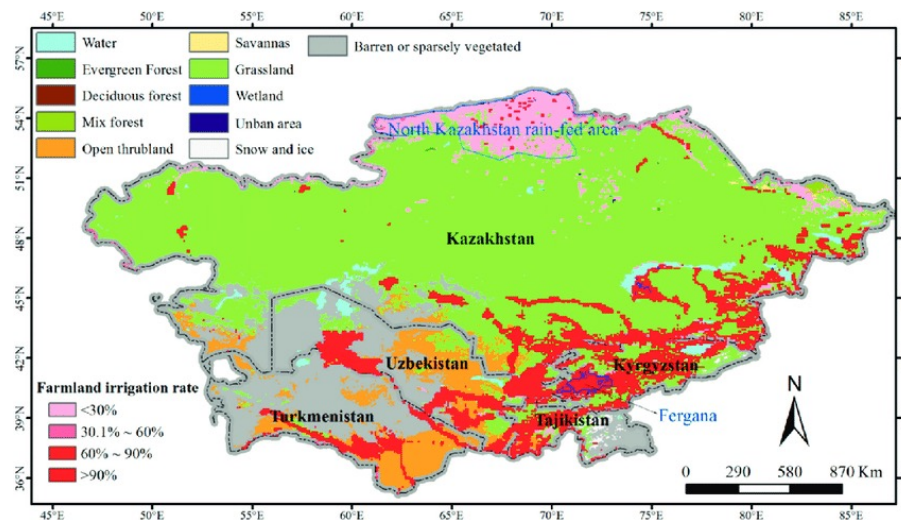


Image: Land use map of Central Asia (adapted from Li et al. (2020))



Drought-resistant fruit and nut trees growing in the dry reaches of Tajikistan. [Bioversity International](#), [B.Vinceti](#)



[Farmers with fruit trees in Central Asia.](#)
Mr. L. Nikolyai, Uzbek Research Institute of Forestry



[Agriculture in Central Asia: Unlocking the Potential.](#) An Interview with Irna Hofman



Promoting the penetration of agrobiomass heating in European rural areas

Thank you for your attention and don't forget:



- Matchmaking Event + Webinar
- 11th May 2022, 20th April
- Register at this link: <https://bringing-value-to-agrobiomass-3.b2match.io>



- Virtual site-visits to Agrobiomass facilities
- 29th April 2022
- Register at this link: <https://forms.gle/JtUpjPX3Dqh47tfh9>

Contact:



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Visit us at: www.agrobioheat.eu



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