

BBioNets

Boosting the adoption of Bio-Based Technologies

BBTs Roadmap Implementation

CZECH REPUBLIC

CREA - CONSIGLIO PER LA RICERCA IN AGRICOLTURA E L'ANALISI DELL'ECONOMIA AGRARIA

BIO EAST HUB

NOVEMBER 2025

Funded by the European Union



1. Description of the Top 20 BBTs for Czech region

The BBTs Assessment Tool made it possible to identify a ranking of BBTs for each region. The following table presents **the Czech top 20 BBTs** by ranking. In particular, the following table provides the outlines of various projects and initiatives related to sustainable agricultural practices and the utilization of by-products and residues from farming and forestry stored in the Bio-Based Technologies (BBTs) inventory[1].

Table 1: Ranking of the top 20 Czech BBTs.

Code	BBT codes	Description BBT	Rank CZ
FR12	FR12-SeCoPPA /ALFLF	Alfalfa is dried and granulated using a dryer powered by solar energy, wood residues and electricity	1
EE9	EE9-Hay Biosyngas/HAYBG	Hay and agroforestry residues are processed using heat and biocatalytic pyrolysis to produce biochar	2
HU7	HU7-REFERTIL/3RZRO	3R zero emission pyrolysis plant recycles and reuses un-exploited biomass for recovery of concentrated Phosphorus and natural BioPhosphate products.	3
FI3	FI3-ForestChip4Farm/FC4FH	farm-level heating plants (400-500kW) to use fresh forest-chips	4
CZ103	CZ103-TJ-Grow_media/GROW	Use liquid part of digestate – fugate originated from the biogas plant.	5
CZ109	CZ109-TH-Compost_biochar/COMP	Composting process (intensification of organic matter decomposition) by addition of biochar.	6
FI10	FI10-Wood2Biogas/Wd2BG	gasification of wood and the use of wood syngas plus biogas from manure to produce biomethane	7
ES39	ES39-INCREdible/RESIN	Resin production as a non-wood forest product	8
CZ106	CZ106-TH-soil_organisms/SOIL	Method and design of equipment for the treatment (activation) of mainly biochar and also digestate.	9
CZ107	CZ107-QK-torrefaction/WWTP	Fertiliser production using sewage sludge.	10
IT11	IT11-Clean-ER/CLINR	small wood chipping machine for collecting wood biomass from mountain forests and their pyrolysis to obtain energy and biochar	11
CZ105	CZ105-QK-potato-growing/TATER	The innovation will be based on a replacement of plant protection products and fertilisers by sustainable procedures of growing.	12
CZ112	CZ112-FW-fertiliser_applications/PREAG	Accurate and targeted application of liquid substances into the soil	13
DE4	DE4-Lignocellulosic Biorefinery/LIGNO	Anaerobic digestion of farm residues (wood, grass, straw)	14
IE13	IE13-BBFB/CHAR	Agricultural biomass such as rushes, gorse, bracken and hazel, is used to produce biochar in a mobile pyrolysis unit	15
FR17	FR17-Pyrogreen/PYROG	This technology converts biomass (wood, crops and forest residues) into high-value products	16
PL75	PL75-Dishes from the Mill/Dishes from the Mill	production of gluten-free crockery from milling by-products	17
PL101	PL101-Biała Wrona/Biała Wrona	technology for organic beer production and food additive based on spent grain	18
PL92	PL92-Modern Deer Farming/Modern Deer Farming	technology of effective summer feeding of farm deer	19
IT2	IT2-FABER/FABER	Use of forest biomass for biochar production	20

Source: Bio-Based Technologies (BBTs) inventory

[1] The Inventory and the Assessment Tool are freely and publicly accessible through the BBioNets project website (www.bbionets.eu).



2. Benchmarking: Regional characterization

In this step, the aim is to analyse the top 20 BBTs macro-characterisations under the regional light, using comparison to the other regions.

The **co-occurrence matrix** is used to analyse the simultaneous presence of two or more BBTs in different Regions, setting the Czech region as a pivot, through the representation of a binary matrix.

Table 2: Co-occurence matrix for Czech Republic

BBT codes	Code	CZ	IT	IE	ES	PL	EL	TOT
FR12-SeCoPPA /ALFLF	FR12	1						1
EE9-Hay Biosyngas/HAYBG	EE9	1						1
HU7-REFERTIL/3RZRO	HU7	1						1
FI3-ForestChip4Farm/FC4FH	FI3	1			1			2
CZ103-TJ-Grow_media/GROW	CZ103	1						1
CZ109-TH-Compost_biochar/COMP	CZ109	1				1	1	3
FI10-Wood2Biogas/Wd2BG	FI10	1						1
ES39-INCREdible/RESIN	ES39	1						1
CZ106-TH-soil_organisms/SOIL	CZ106	1						1
CZ107-QK-torrefaction/WWTP	CZ107	1				1	1	3
IT11-Clean-ER/CLINR	IT11	1		1	1			3
CZ105-QK-potato-growing/TATER	CZ105	1						1
CZ112-FW-fertiliser_applications/PREAG	CZ112	1						1
DE4-Lignocellulosic Biorefinery/LIGNO	DE4	1		1	1	1	1	5
IE13-BBFB/CHAR	IE13	1		1				2
FR17-Pyrogreen/PYROG	FR17	1						1
PL75-Dishes from the Mill/Dishes from the Mill	PL75	1						1
PL101-Biała Wrona/Biała Wrona	PL101	1						1
PL92-Modern Deer Farming/Modern Deer Farming	PL92	1						1
IT2-FABER/FABER	IT2	1						1

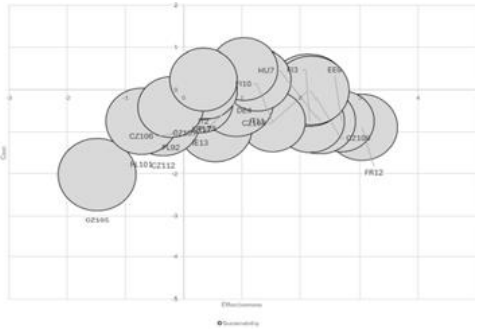


Figure 1: Snake path for Czech Republic

Czech shows strong collaboration with Spain and Greece in implementing multiple BBTs—particularly bioenergy-related ones—while only three originate from Czech itself and most others come from the Mediterranean area.

The arrangement of the Top 20 BBTs of Czech Republic as ordered in the BBTs Assessment Tool (the so-called "snake") in direct comparison with the other five regions under observation here. In the **Czech chart**, most BBTs are clustered and closely together. The sustainability dimension seems very relevant, with generalized big size of the bubbles that compose the s -called snake. A cluster of BBTs are found around the origin, split in 3 and 4 quadrants, where the Y axe as a pivot; it means that effectiveness plays however a relevant role. The dimension of effectiveness seems very variable. Practically, all of the BBTs have a positive cost estimate (cost savings area) and some fall into quadrant 3 as they do not have a high level of effectiveness.



3. Regional BBT ID card

The **plot box graph** presents the distribution of the three variables brought back to a common range of variability (adjusted), i.e. efficiency, cost, sustainability, of the total 113 BBTs presented in the Bio-Based Technologies (BBTs) inventory, according to the Czech ranking (BBTs Assessment Tool). The analysis for the Czech Republic shows that the efficiency variable (EFF_adj) covers a wide range of values, both positive and negative, but maintains a relatively narrow interquartile range. Cost (COST_adj) displays the highest dispersion, with several extreme values, indicating significant variability across the dataset. Sustainability (Sust_adj) is more compact, with most values concentrated between -2.5 and 1.5. Among the three, EFF_adj stands out as the most effective variable in capturing internal variability while remaining less affected by outliers. This suggests that efficiency provides a balanced representation of differences among BBTs.

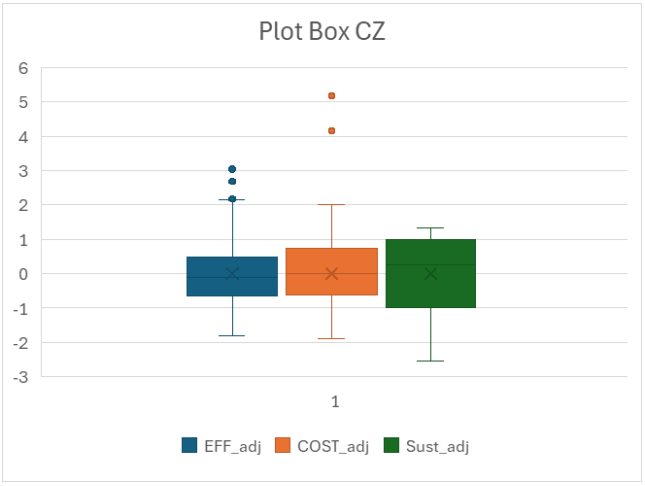


Figure 2: Czech Republic Cost–Sustainability–Effectiveness box plot.

The Czech **SWA** (Strong, Weam Ambiguous Factors) **Matrix** is presented in the table. The SWA matrix is set on the base on the first 20 Czech BBTs, processed under a pivot analysis scheme. The SWA matrix aims to highlight the most represented factors, characterising the cluster of the 20 BBTs. A second objective is to outline a hypothetical "best BBT" suited to the Czech region. This ideal technology would focus on agricultural and post-harvest crop activities, utilizing locally available biomass residues and wastes as valuable resources. It would operate on a regional scale, supported by Rural Development Funds through Operational Groups. The initiative would primarily involve advisors, researchers, farmers, and processors, while also engaging other relevant stakeholders. The technology should have a mature level of readiness (high TRL) and generate agronomic inputs as its main outcome. Strongly linked to crop residue utilization, recycling, and biorefining processes (as described by Escobar and Laibach, 2021), it would ensure high environmental sustainability, significant carbon sequestration capacity, and balanced attention to both economic and social aspects.



Table 3: Czech SWA matrix

	Strong Factor	Weak Factor	Ambiguous Factor
NACE	Priority_1: A1.6Support activities to agriculture and post-harvest crop activities (8)	Priority_2 A2.1Silviculture and other forestry activities, A2.3Gathering of wild growing non-wood products (2)	
FUNDING	Rural development 2014-2020 for Operational Groups (10) other (7)		
NUM PARTNER			nr
TYPE PARTNER	Advisor (12) ; Researcher (37); Processor or retailer (21), Farmer (14); other (19)		
FOCUS AREA	Priority_5 (10)	FA 3A:	
STATUS	Completed (14)		
SCOPE	Local & regional (11)		
KEY WORD	Circular economy, incl. waste, by-products and residues	Forestry	
BBT CATEGORIES	Crop residues and perennial plants F1 (18); Biorefineries C2 (15);	Microbial assisted processing C1 (3)	
FEEDSTOCK	Biomass residues (9) (alfa-alfa, forest residues)		
OUTCOME	Agronomic input (9) (Biochar, fertilzers)	Breeding input (3)	
TRL	TRL 7/8/9 (11)		nr
MOBILITY	Static (14)		
VALUE CHAIN	3 - High potential - Significant arisings of feedstocks available currently. (19)		
C SINK	3 - High potential - strong potential for carbon sequestration at the feedstock and product level). (14)		
CONDITIONS			nr
COMPLEXITY	2 -easy to use /replicate		nr
SUST ECO	3 - High potential - Expected to bring at least 3 significant economic benefits. (13)		
SUST SOCIO			nr
SUST ENVI	3 - High potential - Expected to bring at least 3 significant environmental benefits. (19)		
VALUE ADDED	Food/Feed = High (13)		

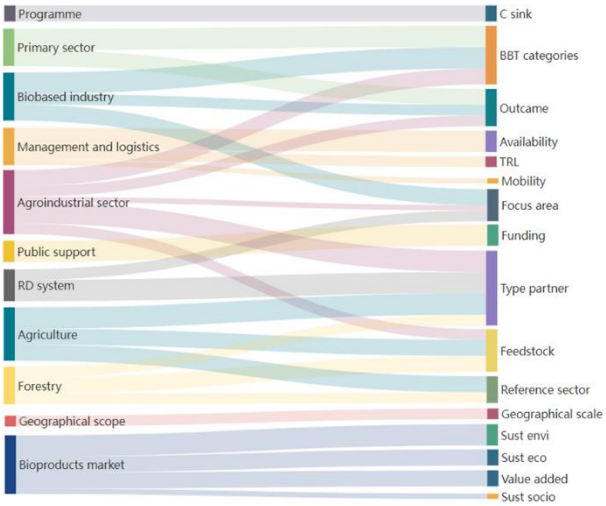
4. Towards the top 5 BBTs

The table is the **matrix of regional dynamics (DYN)**. It represents a snapshot of the Czech region situation in terms of biomass and technologies availability, regulation framework, support and financial policies, as well as the research and development system.

The Czech regional dynamics are mainly driven by a diversified agricultural sector focused on cereals, rapeseed, sugar beet, and livestock production. Modernization and technological innovation are enhancing productivity and sustainability. The bio-based industry is emerging, supported by EU and national funding programs promoting circular economy initiatives. Research institutions play a key role in developing biomass valorization and bioproducts.

Table 3: Czech DYN matrix

BIOMASS AND TECHNOLOGY	REGIONAL DYNAMICS
Agriculture	largest category (7.0%); medium-sized category (31.9%); smallest category (60.0%). cereals, green harvested crops (maize and other forage crops), sugar and starchy crops and oil crops. Cereals per grain, wheat, corn on the green, barley
Forestry	coniferous trees (52.7%), spruce (31.8%), followed by beech (18.1%), oak (15.6%) and pine (8.1%). wood species
Agroindustrial sector	foodstuff or beverage production; coniferous; stemwood
Biomass availability	Cereal grains, agricultural biomass, manure from livestock sector, straw, residues from stemwood (primary and secondary), sawdust, bark and black liquor
Management and logistics of biomass resources	transport and storage problems: many biomasses related industries fall under the authority of different ministries, regional authorities, or private organisations, since their exploits are bordering with many different jurisdictions.
Bio-based industry	using biological textile waste as a source for material; conversion of waste frying oils into bacterial bioplastics; heating pellets.
Bio-products target market	bio-based textiles; biotechnology sector; Bioplastics manufacturing; furniture
REGULATORY FRAMEWORK	
National Strategy/Programme	The State Environmental Policy of the Czech Republic (SEP)
SUPPORT AND FINANCIAL POLICIES	
Public	Ministry of Agriculture Applied Research Program 2017-2025 ; National Agency for Agricultural Research (NAZV)
Private	donor organisation (The International Visegrad Fund)
R&D system	
R&D system associated with biomass valorization	The Czech Republic has an active participation of Research Institutes and SMEs specialising in agriculture research under the scope of bioeconomy. There are a number of Associations of like-ventured SMEs and organisations, creating a valuable network of collaboration between specialists.



The cross-referencing of the DYN Matrix and SWA Matrix enables the assessment of relationship consistency among different items under a coefficient's matrix (**techno-territorial synergy matrix TTS)**. Applying those coefficients to the top Czech 20 projects led to estimate and identify the best 5. The Sankey chart represents the directions and the relevance of the links between regional dynamics and BBTs characteristics, as sort form the TTS matrix.

Figure 3: Pairing of Greek BBTs with dynamic matrix components in a Sankey diagram

We can point out that an ideal BBT in the Czech Republic situation could be related to the agricultural sector, rather than forestry, and supported by Rural Development measures; the more relevant partners are farmers, players from R&D system, and agro-industry. It could refer to biomass from agriculture firstly and ago-industry (less from forestry) as feedstock. The outcomes are focused on primary and agro-industry sector. The characteristics of the bio-based industry as well as market and logistical aspects are to be considered as relevant, as well as the environmental sustainability.



These criteria are applied to the top 20 BBTs to identify the five most suitable for

Table 4: TTS Greek matrix

Czech Republic	Geographical scope	Agriculture	Forestry	Primary sector	Agroindustrial sector	Management and logistics	Bio-based industry	Bio-products market	Programmes	Public support	Private Support	R&D system
Reference sector												
Funding												
Type partner												
Focus area												
Geographical scale												
BBT categories												
Feedstock												
Outcome												
TRL												
Mobility												
Availability												
C sink												
Sust eco												
Sust socio												
Sust envi												
Value added												
		Very high		High		Medium		Low		Nr		

5.The 5 best BBTs for Czech Region

The five selected BBTs for the Czech Republic focus on key challenges related to soil health, water resource conservation, sustainable agricultural practices, and efficient biomass utilization. These innovations offer practical solutions for improving resource efficiency and environmental sustainability in the region.

Table 5: Czech 5 best BBTs.

Region	TTS Rank	BBT Code	Description BBT	Needs / Problem statement	Score
CZ	1	CZ106-TH-soil_organisms/ SOIL	Method and design of equipment for the treatment (activation) of mainly biochar and also digestate.	Efficient use of processed field by-products.	7
CZ	2	CZ105-QK-potato-growing/ TATER	The innovation will be based on a replacement of plant protection products and fertilisers by sustainable procedures of growing.	The issue of protecting water resources while maintaining the competitiveness of agricultural production in their vicinity is quite complex.	6,83
CZ	3	DE4-Lignocellulosic Biorefinery/LIGNO	Anaerobic digestion of farm residues (wood, grass, straw)	To valorize the lignocellulosic residues (meadow grass) from farms in a sustainable way.	6,06
CZ	4	IT2-FABER/FABER	Use of forest biomass for biochar production	Forest biomass and its management to address climate change and GHG emissions.	5,94
CZ	5	FR12-SeCoPPA /ALFLF	Alfalfa is dried and granulated using a dryer powered by solar energy, wood residues and electricity	challenges in efficiently drying alfalfa for animal feed, and a need to utilize manure and shredded wood from hedgerows	5,88

The first two projects, **CZ106-TH-soil_organisms/SOIL** and **CZ105-QK-potato-growing/TATER**, address soil management and sustainable crop production. The activation of biochar and digestate in the first project enhances soil fertility and carbon sequestration, while the second project offers an alternative approach to plant protection and fertilization, reducing the impact on water resources without compromising agricultural productivity. The **DE4-Lignocellulosic Biorefinery/LIGNO** project contributes to circular bioeconomy efforts by transforming lignocellulosic residues such as meadow grass, wood, and straw into valuable bioproducts.

Its integration into farm operations supports sustainable waste management and renewable energy generation. The **IT2-FABER/FABER** project focuses on biochar production from forest biomass, providing an effective solution for managing forestry residues while contributing to climate change mitigation through carbon sequestration and improved soil health. Given the significant forested areas in the Czech Republic, this approach aligns well with regional resource management strategies. The **FR12-SeCoPPA/ALFLF** project enhances the efficiency of alfalfa drying using renewable energy sources. By utilizing solar power, wood residues, and electricity, this innovation improves feed production while making use of farm by-products such as manure and shredded wood, supporting sustainability in livestock farming. The selection of these BBTs reflects a strong emphasis on practical application, regional adaptability, and environmental benefits. The selected BBTs are complementary to the characteristics of the Czech Republic mostly in terms of available biomass or through the compatibility of a technology or methodology to the needs and implementation capacity of the region. So, while their ranking may not fully align with conventional assessment models, their relevance to the specific conditions and needs of the Czech Republic highlights their potential for effective implementation in the bioeconomy sector. The Czech Republic members of the BBioNets project advisory board validated the "Region-specific prioritisation list of Bio-Based Technologies and practices". According to AB the list of top 20 most suitable BBTs content many important projects for the region such as FR17-Pyrogreen/PYROG, HU7-REFERTIL/3RZRO, CZ103-TJ-Grow_media/GROW, but they are agreeing with the best top 5 BBTs. About possible implementation over the next five years, the AB believes that it could be possible.

FURTHER SOURCES OF INFORMATION: Roberto Cagliero, Laura Mirra, Francesco Basset, Francesca Moino, Patrizia Borsotto (CREA), Valentina Galantari, Katerina Panailidou, Alexandros Savidis – (BIO-HUB)

Document information

Title	BBioNets – Creation and promotion of Forest and Agriculture Networks to boost Bio-Based Technologies adoption and Value Chain development (GA No 101133904)
Start – end date	1/11/2023 – 31/10/2026 (36 months)
Project type	Coordination and Support Action
Programme	Horizon Europe – Cluster 6
Funding	1,998,636.20 €
Coordinator	Munster Technological University Ms. Carmen Girón Domínguez (carmen.dominguez@mtu.ie)
Project overview	BBioNets constitutes a thematic network that relies on, promotes, and further advances the work carried out by EIP-AGRI Operational Groups (OGs) with respect to **management and/or processing of agricultural and forest biomass with Bio-Based Technologies (BBTs)**. The project has set up 6 regional Forest and Agriculture Networks – FANs (IE, ES, IT, EL, PL, CZ) that identify local needs, prioritise specific BBTs and share BBT knowledge ready for practice to farmers and foresters, boosting the (re)definition of value chains, stimulating cross-fertilisation beyond borders, and bringing Europe to the forefront of farming, forestry and bioeconomy with economically viable and sustainable practices.
Consortium	

info@bbionets.eu

/bbionets-eu /bbionets.eu @bbionets_eu

@bbionets-eu.bsky.social @bbionets_eu @BBioNetsEU

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.