BRANCHES

BOOSTING RURAL BIOECONOMY NETWORKS

BRANCHES

Boosting RurAl bioeconomy Networks following multi-actors approaCHES

(No. 101000375)

Deliverable

D5.5 FIRST SET OF PRACTICE ABSTRACTS

Deliverable Lead: Luke

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Document Control Page	
Title	First set of practice abstracts
Creator	Johanna Routa, Robert Prinz
Description	The present document presents the practical abstracts collected in the first period of the project in short Excel form. All abstracts has also been presented in longer pdf form in project website.
Contributors	Routa, J .Prinz,R., Kiviranta,K.
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Type	report
Language	English
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Review status	Coordinator accepted

DISCLAIMER

Project Information

Project identifier (see INSTRUCTIONS)	2021H2020_101000375_BRANCHES
Title of the project in native language (*can be the language of the coordinator / one of the partners - otherwise repeat the title in English*)	Boosting RurAl Bioeconomy Networks following multi-actor approaCHES - BRANCHES
Title of the project in English (*provide the project ACRONYM + short title within the characters limit*)	Boosting RurAl Bioeconomy Networks following multi-actor approaCHES - BRANCHES

Geographical location

Country (*of the coordinator*)	FI
Main geographical location (NUTS3) (of coordinator - *for geolocalisation on map*)	FI1B1 - Helsinki-Uusimaa

Editor of the text: person/organisation responsible for delivering the text	Natural Resources Institute Finland (Luke)

Project coordinator (lead-partner) according to the cooperation/consortium agreement:

Name	Johanna Routa
Address	Yliopistokatu 6 B, 80100 Joensuu, Finland
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Telephone	+358295325045

Project period:

start year (YYYY)	2021
end year (YYYY)	2023

Project status: ongoing (after selection of the project) or completed (after final payment)	ongoing
Main **funding source** (Rural development programme, H2020, or other EU, national/regional or private funds)	H2020
Total budget of the project (total costs - in euros)	1 999 308,75
Objective of the project in English: what problems/opportunities does the project address that are relevant for the practitioner/end-user, and how will they be solved? - (300-600 characters, word count – no spaces)	The overall goal of BRANCHES is to foster knowledge transfer and innovation in agriculture, forestry and rural areas, enhancing the viability and competitiveness of biomass supply chains and promoting innovative technologies, rural bioeconomy solutions, and sustainable agricultural and forest management. This will be achieved by applying a participatory, multi-actor approach which engages relevant stakeholders across the various targeted value chains, combined with a strong dissemination, exploitation and communication strategy which will share the activities and results of BRANCHES.

Objective of the project in native language (*can be the language of the coordinator / one of the partners - otherwise indicate "see objectives in English"*) (300-600 characters, word count – no spaces)	see objectives in English
Description of project activities in English: (max 600 characters, word count – no spaces): short summary highlighting main project activities.	• Identify, summarize, share and present the existing best practices and research results; • Increase implementation of cost-efficient new technologies by enhancing active knowledge transfer between practitioners and researchers; • Mobilize more biomass and create new business opportunities in rural areas by improving and strengthening the connection between practice and science; • Apply a multidisciplinary, multi-actor approach; • Offer a channel for two-way flow of information, new ideas and technologies; • Point out needs identified and entrepreneurial elements relevant for
Description of project activities in native language: (*can be the language of the coordinator / one of the partners*) (can be (max 600 characters, word count – no spaces): short summary highlighting main project activities.	
Description of the context of the project in English (e.g. drivers in legislation/ markets or other causes that were at the origin of the project, etc.)	Research on creating a strong, self-sufficient, circular and sustainable bioeconomy has accelerated during the last ten years and a vast amount of knowledge has been generated. However, due to the multiple sectors and complex value chains involved, a significant part of that valuable information is in danger of remaining untapped, due to insufficient communication between experts on these advances, and practitioners, i.e. the potential end-users of this knowledge, such as farmers, foresters and entrepreneurs. The practitioners are expected to supply raw materials and endorse the strengthening of a sustainable bioeconomy as a major aspect of rural development in their regions, but require improved networks such as those developed in BRANCHES, in order to facilitate knowledge exchange and uptake.

Additional information on the project in English (as appropriate e.g. about activities to connect with the relevant sector and actors, farmers, businesses, etc.)	BRANCHES project offer a channel for two-way flow of information, new ideas and technologies within European agriculture and forestry practitioners and multipliers in rural areas.BRANCHES will apply a multidisciplinary, multi-actor approach through its partnership and extended network activating practitioners to work together with project partners and each other's in BRANCHES networks.
Additional comments (in English): free text field which can be used by the editor e.g. for listing facilitating elements or obstacles for the implementation of the produced results, for suggestions for future actions/research, for messages to end-users etc.	

EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR AGRICULTURE AND RURAL DEVELOPMENT

Directorate B. Quality, Reserach & Innovation, Outreach
B.2. Research and Innovation

EIP-AGRI Common format for interactive innovation projects

The interactive innovation approach under the European Innovation Partnership Agricultural Productivity and Sustainability (EIP-AGRI)[1] fosters the development of demand-driven innovation, turning creative new ideas into practical applications thanks to interactions between partners, the sharing of knowledge and effective intermediation and dissemination.

The EIP **common format** consists of a set of basic elements characterising the project and i**ncludes one (or more) "practice abstract"(s)**. The format was developed with two main objectives:
(1) to enable contacting partners and incentivise efficient knowledge exchange, and
(2) to disseminate the results of the project in a concise and easy understandable way to practitioners.

The common format allows providing information all along the life-cycle of the project. The **content of the common format can be updated at any moment** when useful, for instance in an intermediate phase of the project. Project information should at least be available at the beginning (describing the situation at the start of the project, including project title and objectives) and at the end of the project (describing the results/recommendations resulting from the project, including a final project report and one or more practice abstracts).

The **common format** consists in obligatory, recommended and optional elements. Its fields are listed in the bullets below.

1) Obligatory elements

- **Title** of the project in native language: short and easily understandable (one key sentence on the project; max 150 characters, word count – no spaces)

- **Title** of the project in English: short and easily understandable (one key sentence on the project; max 150 characters, word count – no spaces)

- **Editor** of the text: person/organisation responsible for delivering the text

- **Project coordinator** (lead-partner) according to the cooperation/consortium agreement: name, address, e-mail, telephone

- **Project partners**: name, address, e-mail, telephone, type of partner (farm holder, advisor, research institute, SME, NGO, or other)

- **Keyword-category** (to be chosen from a pre-defined list of categories)

- **Project period** (starting date, end date)

- **Project status**: ongoing (after selection of the project) or completed (after final payment)

- Main **funding source** (Rural development programme, H2020, or other EU, national/regional or private funds)

- **Total budge**t of the project

- **Geographical location** where the main project activities take place: NUTS 3 level, to enable contacting within/between a climatic/regional entities

- **Final report** (in the form of an annex), including a substantial description of the results - obligatory once the project is completed – to be drafted according to the requirements specific for the funding source

- **Practice "abstract":**

• **Objective** of the project in native language: what problems/opportunities does the project address that are relevant for the practitioner/end-user, and how will they be solved? - (300-600 characters, word count – no spaces)

• **Objective** of the project in English: what problems/opportunities does the project address that are relevant for the practitioner/end-user, and how will they be solved? - (300-600 characters, word count – no spaces)

• **Short summary for practitioners** in native language on the (final or expected) outcomes (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)

- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

2) Recommended elements

• **Description of project activities** in native language: (max 600 characters, word count – no spaces): short summary highlighting main project activities.

• **Description of project activities** in English: (max 600 characters, word count – no spaces): short summary highlighting main project activities.

• **Short summary for practitioners** in English: short summary according to guidance (see box above under "practice abstract"; 1000-1500 characters, word count - no spaces)

• **Audiovisual material** which is useful and attractive for practitioners (e.g. YouTube link, videos, other dissemination material)

• **Website** of the project (URL)

• **Links to other website(s)** hosting information on the project (results) that are available after the project has ended, by preference using the existing local/regional/national communication channels that practitioners most often use.

3) Optional elements

• [additional fields are available for additional practice abstracts]: **Practice "abstract"** in native language: short summary according to the guidance in the text box above (max. 1500 characters, word count – no spaces)]

• [additional fields are available for additional practice abstracts]: **Practice "abstract"** in English: short summary according to the guidance in the text box above (max. 1500 characters, word count – no spaces)]

• **Description of the context of the project** (e.g. drivers in legislation/ markets or other causes that were at the origin of the project, etc.)

• **Additional information** on the project as required by the specific guidance at national / regional level (e.g. for detailed monitoring purposes)

• **Additional comments**: free text field which can be used by the editor e.g. for listing facilitating elements or obstacles for the implementation of the produced results, for suggestions for future actions/research, for messages to consumers, etc.

Context:

Rural Development Policy 2014-2020 and the European Union Research and Innovation Policy "Horizon 2020" both aim at demand-driven innovation and complement each other in providing opportunities for EIP interactive innovation projects. Rural development programmes are applied within a specific programme region, whilst H2020 research goes beyond this scale by funding innovative actions at transnational level. Rural development Operational Groups and interactive and practice-oriented projects under Horizon 2020, such as multi-actor projects and thematic networks, will feed the EIP-AGRI web database for practitioners using the common format.

Under the EIP-AGRI, synergies and complementarities have been developed between the Horizon 2020 EU research policy and the rural development policy under the CAP. Therefore, they all use the same EIP-AGRI web database. Moreover, all Horizon 2020 multi-actor projects are strongly recommended to involve relevant interactive innovation groups operating in the EIP-AGRI context, such as rural development Operational Groups. Multi-actor projects may provide potential innovative material to rural development Operational Groups for further development and vice versa. The EIP-AGRI network is there to link them.

Why an EIP-AGRI common format?

Communicating about projects, activities and results - both during and after the project's lifetime – at the EU level is much easier through the use of a common format for practice-oriented projects. Such common format **facilitates the knowledge flow and enables contacting** of farmers, researchers and all other actors involved in innovation projects. The content of the common format was developed and agreed at EU level thanks to the work of the Standing Committee for Agricultural Research (SCAR)[2]. Using the common format for practice oriented projects will also give visibility to actors involved and enable measuring impact and rewarding of researchers' work for practice, in an analogue approach to research abstracts in peer reviewed journals.

How will the information in the EIP common format be shared?

The **EIP-AGRI website**[3] will host and share the information at the EU level.. The EIP-AGRI common format is recommended to all projects that wish to provide information on their concrete outcomes for practitioners. These include interactive and practice-oriented innovation projects funded by sources other than rural development programmes and Horizon 2020, for instance national/ regional funding, Interreg, etc.

Which projects will use the common format?

The common element between the 3 types of projects listed below in more detail is that they all envisage implementing the EIP-AGRI interactive innovation approach, and all deliver outputs that are expected to be useful for practitioners.

1. Multi-actor projects

The H2020 **multi-actor approach**[4] aims at demand-driven innovation: research projects' objectives and planning are targeted to needs/problems and opportunities of end-users, and should result in practical knowledge which is easy understandable and accessible. The approach requires that end-users and multipliers of research results, such as farmers, farmers' groups or advisors are closely involved throughout the whole project period. This should lead to innovative solutions that are more likely to be applied in the field, because those who need the solutions will be involved right from the start and will bring in complementary practical knowledge: from defining the questions, to planning, to implementing research work, to experiment and right up until possible demonstration and dissemination.

2. Thematic networks

Thematic networks[5] are a particular format of multi-actor projects that aims to compile knowledge ready for practice in a specific field. This knowledge should be easily understandable for practitioners, stay available beyond the project period, and also be shared through the EIP-AGRI network. Thematic networks will summarise and present best practices and research results with a focus on themes and issues that are "near to be put into practice", but not sufficiently known yet by practitioners.

3. EIP Operational Groups

Operational Groups[6] are multi-actor projects funded under the rural development policy. They have an obligation to make the plans and results of their work available for others in the EIP network to use. The use of the EIP-AGRI common format for reporting on operational group projects through the EIP-AGRI network will definitely play an important role in this regard, as it will help connecting Operational Groups funded under rural development with Horizon 2020 research consortia on specific topics and themes.

What are common elements for the "interactive" innovation projects developed under the EIP-AGRI?

In the **interactive innovation model**, building blocks for innovation are expected to come from science, but also from practice and intermediaries, such as farmers, advisors, businesses, NGOs, etc. Key for interactive innovation is to include existing (sometimes tacit) knowledge into building innovative solutions, which is crucial for tackling complex challenges in a holistic approach. In interactive innovation projects, end-users and practitioners are involved, not as a study-object, but in view of using their entrepreneurial skills and practical knowledge for developing the solution or opportunity and creating co-ownership. Innovation generated with an interactive approach tends to deliver solutions that are well adapted to real circumstances and easier to implement since the wider participation speeds up the acceptance and dissemination of new ideas. In short, the focus of interactive innovation is: "an idea put into practice with success". A new idea turns into a genuine innovation only if it is widely adopted and proves its usefulness in practice.

EIP-AGRI: “Ideas, put into practice, with success”

Having potential innovative knowledge is one thing, turning it into reality is another.

[1] The European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI) was launched by the European Commission in 2012. It aims to foster a competitive and sustainable agriculture and forestry sector that "achieves more from less": http://ec.europa.eu/eip/agriculture/en/content/eip-agri-part-eu%E2%80%99s-growth-strategy-decade

[2] The SCAR Strategic Working Group on Agricultural Knowledge and Innovation Systems (SWG AKIS) developed the common format on the basis of experience in Member States

[3] http://ec.europa.eu/eip/agriculture/

[4] http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-food_en.pdf p.10 definition of multi-actor approach

[5] http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-food_en.pdf p.139 Thematic Networks compiling knowledge ready for practice

[6] See section 4.1 of the rural development EIP guidelines http://ec.europa.eu/eip/agriculture/sites/agri-eip/files/pb_guidelines_eip_implementation_2014_en.pdf

INFORMATION ON USE OF PERSONAL DATA COLLECTED VIA THIS TEMPLATE

The project information provided with this template - thus including the contact details of the project coordinator and the project partners when these are provided - will be made publicly available on the EIP-AGRI website (*https://ec.europa.eu/eip/agriculture/en*). Visitors of the EIP-AGRI website may use this information to establish contacts with the project to, for example, propose collaborations and expand their network.

By submitting this template to the email account *AGRI-EIP-PRACTICE-ABSTRACTS@ec.europa.eu* the project coordinator and the project partners listed in the template are aware that the information provided in the template (including contact details when these are indicated) will be published on the EIP-AGRI website.

The acquisition of personal data through this template and their further processing are limited to the objectives and the operations described by the Privacy statement covering the activities of the EIP-AGRI Network, which is available at the following link: *https://ec.europa.eu/eip/agriculture/en/privacy-statement-processing-personal-data-related*

In case you have questions related to the collection and processing of your personal data, the general rules for processing of personal information in the context of the EIP-AGRI network activity, or on your rights to have it modified, corrected or deleted, please contact *agri-EIP@ec.europa.eu*

Giving consensus for publishing contact details of the project coordinator and partners

Under the sections PROJECT INFORMATION and PARTNERS of this template, project coordinators and their partners are asked to provide their contact details and express their agreement to publish them on the EIP-AGRI website. The consent for publication is given by ticking the related consensus checkbox next to each partner's name.

ATTENTION: The project information provided with this template will be published on the EIP-AGRI website only if consensus for the publication of the contact details is provided through the procedure described above.

Project identification

Please indicate whether the information refers to a multi-actor project or a thematic network	Thematic network	*Mandatory*

Project partners (mandatory information) - *N.B. : "Name" can be that of the Organisation or of a contact person - "Address" should include the country*

	Name	Address	E-mail	Telephone	Type of partner
project coordinator (lead partner) *from PROJECT INFORMATION*	Johanna Routa	Yliopistokatu 6 B, 80100 Joensu	johanna.routa@luke.fi	+358295325045	research institute
project partner	Raffaele Spinelli	Via Madonna del Piano 10, 5001	spinelli@ivalsa.cnr.it	+39 335 5429798	research institute
project partner	Kirsikka Kiviranta	Koivurannantie 1, FI-40101 Jyvä	kirsikka.kiviranta@vtt.fi	+358 40 671 9516	research institute
project partner	Janusz Golaszewski	Pl. Łódzki 3, 10-727 Olsztyn, Po	janusz.golaszewski@uwm.edu.pl	+48 694428180	research institute
project partner	Laura Garcia	TORGAUER STRASSE 116, 04	laura.garcia@dbfz.de	+49 3412434477	research institute
project partner	Maider Gómez Palmero	PARQUE EMPRESARIAL DINA	mgomez@fcirce.es	+34 976732078	research institute
project partner	Vito Pignatelli	VIA VENAFRO 5, 00159 Rome,	vito.pignatelli.5smy@alice.it	+39 067021118	advisor
project partner	Marko Mäki-Hakola	Simonkatu 6, 00101 Helsinki, Fi	marko.maki-hakola@mtk.fi	+358 405026810	advisor
project partner	Pablo Rodero Masdemont	C PANADEROS 58 ENTREPLA	pablorodero@avebiom.org	+34 689 85 97 89	advisor
project partner	Christina Zinke	PERMOSERSTRASSE 15, 043	christina.zinke@ufz.de	+49 3412434579	research institute

Keyword - category

Keyword - category 1	Forestry
Keyword - category 2	Agricultural production system
Keyword - category 3	Bioeconomy
Keyword - category 4	Value chain
Keyword - category 5	Bioenergy
Keyword - category 6	Forest technology
Keyword - category 7	Agriculture
Keyword - category 8	
Keyword - category 9	
Keyword - category 10	

Audiovisual material which is useful and attractive for practitioners (e.g. YouTube link, videos, other dissemination material) Recommended

Title/description (in English)	URL	Additional comments
	https://www.branchesproject.eu/materials/videos	
	http://	
	http://	
	http://	
	http://	
	http://	
	http://	
	http://	
	http://	
	http://	

Official website of the project — Recommended

Title/description	URL	Additional comments
The BRANCHES PROJECT	https://www.branchesproject.eu/	BRANCHES webpage

Links to other website(s) hosting information on the project (results) that are available after the project has ended, by preference using the existing local/regional/national communication channels that practitioners most often use. — Recommended

Title/description	URL	Additional comments
Branches - verkosto	https://branches.fi	Finnish BRANCHES netw
Branches space on the ITABIA Homepage	http://www.itabia.it/il-progetto-branches/obiettivi.html	Italian BRANCHES webp
INtercamBIOM	https://intercambiom.org/	Spanish NTN website
Netzwerk "Bioökonomie in der Praxis"	https://www.dbfz.de/netzwerk-biooekonomie	German NTN website
Polish National Bioeconomy Network	https://nbnpl.uwm.edu.pl/pl	Polish NTN website
	http://	
	http://	
	http://	
	http://	
	http://	

Practice "abstract" 1:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Bioenergy: a plant based on a chain of exploitation of the olive pruning in Southern Italy

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Fiusis is a 1 MWe cogeneration plant aimed to transform 10,000 t of pruning residues per year into 8 million kWh of electricity and heat. Recently, this plant has been equipped with a wood pellet production line that uses excess heat for drying the sawdust and yields about 1 t of high-quality pellet per day. Moreover, future plans include a facility for turning the wood ash generated by the plant into high-quality fertilizer.
Fiusis was able to create an effective supply chain of biomass by developing a system that matches the local farmers' needs. In particular, Fiusis offers free pruning residue collection and disposal services to over 2,000 farms. This prevents farmers from burning pruning residues in the field, thus avoiding widespread and recurring air quality issues. When pruning residue is burned in the plant – rather than in the field – fumes pass through a high efficiency filtration system able to remove all noxious emission, including fine particulate. The main strengths of the company are:
- Close connection with farmers and agricultural contractors for the recovery of pruning residues.
- Production of clean energy (electric and thermal) from a renewable source available locally.
- Local production of wood pellets, suitable for fuelling high efficiency stoves for residential use.
- Propensity for innovation through scientific research, aimed at life-long learning and continuous improvement.
- Full application of the principles of the circular economy.

The initial investment of 8 M € was made possible through project financing. At present, the company has an annual turnover of around 2 M €, a most important result given the specificity of the local context and

Short title in native language

Bioenergia: un impianto basato su una filiera di valorizzazione delle

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

FIUSIS è un impianto di produzione di energia da 1 MWe, ubicato in Puglia a Calimera (LE), alimentato unicamente con cippato di legno vergine ottenuto dalle potature degli uliveti delle campagne salentine. Entrato in funzione nel 2010, nel corso degli anni ha voluto e saputo creare una filiera locale di approvvigionamento della biomassa integrandosi totalmente con il territorio circostante. A tal fine Fiusis svolge gratuitamente un servizio di raccolta, condizionamento e prelievo dei residui della potatura presso oltre 2.000 aziende agricole, che - con la compilazione di un'apposita scheda - richiedono questo tipo d'intervento. Per lo svolgimento delle sue attività, l'impianto Fiusis ha creato lavoro per circa 33 addetti tra diretti e indiretti, oltre al beneficio tangibile che genera agli agricoltori in termini di riduzione dei costi di gestione delle biomasse residuali. Infatti, prima dell'attivazione della filiera legno-energia di Fiusis, i residui della potatura (circa 10.000 t/anno) venivano bruciati direttamente nei campi con tutte le conseguenze ambientali connesse a tale pratica.
I principali punti di forza dell'azienda sono:
- Stretto collegamento con agricoltori e contoterzisti per il recupero dei residui di potatura.
- Produzione di energia pulita (elettrica e termica) da fonte rinnovabile disponibile localmente.
- Produzione locale di pellet di legno, idoneo ad alimentare stufe ad alto rendimento per uso residenziale.
- Propensione all'innovazione attraverso la ricerca scientifica, finalizzata all'apprendimento permanente e al miglioramento continuo.
- Piena applicazione dei principi dell'economia circolare.

Inoltre, dal recupero dei cascami termici dell'impianto, si essicca una quota del legno vergine raccolto per destinarlo ad una linea di produzione di pellet per stufe in un nuovo stabilimento (70 sacchetti/ora).
Per chiudere l'intero ciclo produttivo, in un'ottica di Economia Circolare, Fiusis è in procinto di costruire un ulteriore stabilimento per recuperare le ceneri prodotte dalla combustione del legno vergine di potature del

Practice "abstract" 2:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Turning low-grade wood into high quality biomass

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Microchip (a very small homogeneous wood chip) production matches the need for replacing industrial pellets with a new product manufactured by small enterprises, using locally available raw materials and low-investment technology.
Even if microchip cannot match the quality of pellets, it is still dry, dense and homogeneous enough for feeding stoves designed for pellet fuel, that are much cheaper compared with a classic chip boiler. Furthermore, microchips are cheaper than pellets, their origin is easier to trace and contribute to local economy.
In Italy, micro-chip production was pioneered by the Travaglini farm already 10 years ago. Customers would be provided with microchip-fed boilers, modified from pellet boliers - and would be assured a sustainable fuel supply at competitive price compared with conventional pellets. At present there are no standards defining microchips, so the certificate generally makes reference to chip quality Class A1+, according to standard UNI EN ISO 17225-1: 2015.
Main success factors are: the reaching final user, the use of unutilized labour resources, control of the raw material supply, capture of opportunity wood and reduced investment cost. The estimated output of slightly over 100 t per year, but it is a very profitable one and it is strategic for optimizing the use of internal resources and for reaching new customers.

Short title in native language

Come valorizzare il legname di scarto producendo biomassa di alta

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

La produzione di cippatino (cippato piccolo e omogeneo) permette di sostituire il pellet industriale con un prodotto fabbricato da piccole imprese, utilizzando materie prime locali e tecnologia a basso investimento.
Anche se il cippatino non può eguagliare la qualità del pellet, ha comunque caratteristiche simili tanto che può alimentare stufe a pellet, più economiche delle caldaie a cippato. Inoltre è più economico del pellet, è facilmente rintracciabile e contribuiscono all'economia locale.
I F.lli Travaglini sono pionieri della biomassa e del cippatino: tra i primi a installare una caldaia a cippato per riscaldare il complesso agricolo e già 10 anni fa hanno iniziato a interessarsi al cippatino. I F.lli Travaglini vendevano già le caldaie a cippatino, le hanno modificate e garantendo un approvvigionamento sostenibile a prezzi competitivi rispetto al pellet.
Al momento non esistono norme che definiscono i microchip, quindi il certificato fa generalmente riferimento alla classe di qualità del chip A1+, secondo la norma UNI EN ISO 17225-1:2015.
I principali fattori di successo sono: la vendita diretta all'utente finale, l'utilizzo di risorse di lavoro non utilizzate, il controllo dell'approvvigionamento di materie prime, la valorizzazione del legname e la riduzione dei costi di investimento. La produzione stimata è poco superiore alle 100 t annue, ma è molto redditizia e strategica per ottimizzare l'impiego delle risorse umane interne e per arrivare a nuovi clienti.

Practice "abstract" 3:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Small-scale pellet production as an opportunity for forest owners and operators

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Pellet can be produced directly by the raw material supplier - the logging company - with the purpose of appropriating a larger share of the added value and keeping it within the rural economy. An example for that is represented by Pierini, a small-scale family-owned logging firm (a fourth generation logger) operating in the Umbria Region of central Italy. The company got into pellet production in 2013, in order to diversify their business and find an alternative to firewood, whose demand is decreasing because the aging rural population is opting for the more convenient pellet alternative, while prices have dropped due to the large increase in the number of firewood operators, since part-time firewood harvesting can be started with minimum equipment and many people have got into that following the financial crisis and the consequent loss of jobs in other sectors.
Since 2013, the company has commissioned a low-investment small-scale pellet plant, using modular industrial components manufactured by a number of different Italian manufacturers.
Plant operation occupies one person, who is completely busy with loading the bunkers, transferring the product from the drier to the refiner, bagging, moving the bags, etc.
The total cost of the process is (2018 figures):
Raw material 40 € t-1
Drying and refining 110 € t-1
Pressing and bagging 100 € t-1
Total 250 € t-1
Pierini are satisfied with the plant and the process. Small-scale pellet production may represent a viable opportunity for forest owners and operators confronted with a declining firewood market. The new product

Short title in native language

Produzione di pellet su piccola scala come opportunità per proprietari e

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

La produzione di pellet può essere effettuta su piccola scala da aziende locali, con lo scopo di mantenere una maggiore componente del valore aggiunto nell'ambito dell'economia rurale. Un esempio in tal senso è rappresentato dall'azienda Pierini, una piccola impresa (SME) boschiva a conduzione familiare con sede in Umbria. L'azienda ha iniziato a produrre pellet nel 2013, per diversificare la propria offerta andando incontro alla crescente domanda di pellet dovuta all'ampia diffusione di moderne stufe alimentate con tale biomassa. Inoltre, la tradizionale legna da ardere ha subito una continua diminuzione dei prezzi, data anche dalla sua possibilità di raccolta part-time che può essere realizzata con semplici ed economiche attrezzature accessibili a molte persone che hanno iniziato questa attività in seguito alla crisi finanziaria. Dal 2013, l'azienda+D73 ha installato un impianto di pelletizzazione del legno di piccole dimensioni e a basso investimento, utilizzando componenti industriali modulari fabbricati da diversi produttori italiani. L'impianto funziona con un solo operatore impegnato nel carico dei bunker, trasferimento del prodotto dall'essiccatoio al raffinatore, insaccamento, movimentazione del prodotto, ecc.
Il costo totale del processo di produzione è (dati 2018):
Materia prima 40 €/t
Essiccazione e raffinazione 110 €/t
Pressatura e insacco 100 €/t
Totale 250 €/t
L'azienda è molto soddisfatta dell'impianto e dell'intero ciclo produttivo attivati. Produrre pellet su piccola scala può rappresentare una valida opportunità, sia per i proprietari di boschi, sia per gli operatori forestali per fronteggiare un mercato della legna da ardere in declino. La penetrazione sul mercato nazionale ed estero di questo nuovo prodotto può sostenere le economie di aree boscate limitando il paradosso della massiccia importazione di pellet industriale prodotto a grandi distanze.

Practice "abstract" 4:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Risupeto – a novel felling head for efficient harvesting of small diameter wood biomass both in forests and edge zones of infrasturuture

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The main problem with the utilisation of untended stands is that small-diameter trees are expensive to harvest and, on the other hand, not all forest owners can afford to tend their sprawling stands into production conditions. Tree volume governs the productivity in small tree harvesting and for each situation one must identify the minimum tree volume that makes harvesting economic: below such a size, productivity does not reach the required level, and the value of the harvest fails to compensate the machine's operating cost. Until now, the equation has appeared difficult to solve, but a wood harvesting innovation – the Risupeto harvesting head - that works on a continuous basis can provide a solution to the problem of untended young stands, as at least part of the costs can be covered by revenue from energy wood sales. It is estimated that the device is most effective in the selective tending of dense 5–8-metre seedling stands and young forests. Maximum productivity is achieved when stems to be removed can be harvested at their full length without having to cut them into shorter pieces. With a robust harvester head capable for continuous cutting and accumulating during crane movement, it is possible to improve the felling-bunching productivity compared to multi-tree handling with conventional accumulating felling heads, equipped with saw bar or shear blade cutting elements. Risupeto (www.reformet.fi/risupeto/) prototype felling head cuts standing trees with two parallel disk sawblades and accumulates trees in an upright position into the collecting chamber using rotating collecting arms. The collecting arms are attached to the two vertical cylinders, which rotate at the same speed as the disk sawblades. When the collecting chamber of the felling head is full, the accumulated tree bunch is moved to the pile and dropped out. The accumulating felling

Short title in native language

Risupeto – hakkuulaite uutuus pieniläpimittaisen puuston

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Hoitorästien hyödyntämisen suurin ongelma on se, että pienet puut ovat kalliita korjata energiakäyttöön eikä kaikilla metsäomistajilla toisaalta ole varaa hoitaa karanneita taimikoitaan tuottokuntoon raivaussahatyönä. Tähän asti yhtälö on vaikuttanut vaikealta ratkaistavaksi mutta jatkuvatoimisuuden periaatteella toimiva iittiläinen hakkuulaite innovaatio – Risupeto – voi tarjota ratkaisun nuorten tiheiköiden hoitorästien purkuun, kun ainakin osa kustannuksista voidaan kattaa suoraan energiapuusta saatavilla myyntituloilla. Aiemmin korjuun esteeksi tai hidasteeksi koettu riukupuu ja alikasvos saadaan koottua hakkuulaitteella hyötykäyttöön, samalla kun metsän parhaat puuyksilöt saavat kasvutilaa, ja vältytään työläältä ennakkoraivaukselta. Arvioiden mukaan kone on tehokkaimmillaan nykyisiin menetelmiin nähden tiheiden 5-8 -metristen varttuneiden taimikoiden ja nuorten metsien hoidossa. Tuottavuus on parhaimmillaan, kun poistettavat rungot voidaan kerätä kokopitkinä eikä koneelta kulu aikaa niiden katkomiseen. Perinteisesti energiapuuta on korjattu giljotiini- ja harvesterikourilla, joiden tuottavuutta on parannettu joukkokäsittelylaitteiden avulla. Joukkokäsittelyominaisuutta hyödynnetään myös Risupedossa mutta sen ohella sekä katkaisu että keruu tapahtuvat jatkuvatoimisesti.Risupeto (www.reformet.fi/risupeto/) katkaisee puut poikki kahdella pyörivällä kiekkoterällä, minkä perästä keruulaite vetää puut oksineen nippuun keruukammioon. Kerätty nippu vapautetaan pyörittämällä teriä vastakkaiseen suuntaan. Jatkuvatoimisuuden avulla päästään eroon puu- tai puskakohtaisesti tapahtuvasta käsittelystä jo kaatovaiheessa. Jatkuvatoimisuuden periaatteesta on hyötyä etenkin, kun korjataan pienikokoista puustoa tai pensaikkoa. Risupeto on suunniteltu käytettäväksi kaivukoneen puomissa.Suurina sarjoina valmistettavien kaivukoneiden etu on niiden metsäkoneita selvästi edullisempi hankintahinta sekä se, että tarvittaessa korjuuvarustus voidaan riisua ja käyttää peruskonetta sille suunnitelluissa perinteisissä maanrakennus töissä.

Practice "abstract" 5:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Energy wood supply chains organized by forest owners in Finland

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The central union of agricultural producers and forest owners (MTK) is responsible for the forest owners benefits in Finland. Further, forest owners have regionally and operationally organized through the 59 individual forestry associations. There are 202 000 forest owner members, which is about 60% of the total number of forest-owning farms in Finland. The large number of members enables the common organized developing of forestry at the regional, national and international level.
Energy wood is an important component of the wood market nowadays in Finland. The aim is to introduce the market of energy wood supply chains organized by forest owners. The following data was collected from individual forestry associations (chief managers, 6/2021) and from using the statistical information.
Results and conclusions:
•According to the average results of forestry associations, the most important source of energy wood is delimbed energy wood. -> Conclusion: It would be important to develop energy wood harvesting methods for young stands.
•Forestry associations have a main role in energy wood supply, since they organize marketing for the forest owners (89%) and harvesting to the roadside (89%). The level of organizing energy wood storages at terminal (59%) and chipping (51%) was little bit lower. -> Conclusion: Forestry associations role is stronger at the beginning of supply chain: selling and harvesting.
•The most common way of organizing energy wood supply by the forestry associations is to use of harvesting services (76%), whereas the own company based model (14%) or the co-operation model (8%) was

Short title in native language

Metsänomistajalähtöinen energiapuun toimitusketju Suomessa

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Maa- ja metsätaloustuottajain Keskusliitto (MTK) on vastuussa metsänomistajien edunvalvonnasta Suomessa. Alueellisesti ja operatiivisesti metsänomistajia palvelee 59 metsänhoitoyhdistystä. Näissä on yhteensä 202 000 metsänomistajajäsentä, jotka edustavat suurinta osaa suomalaisesta yksityismetsäomaisuudesta. Organisoitu metsänomistajien yhteinen edunvalvonta mahdollistaa alueellisen, kansallisen ja kansainvälisen kehittämisen.

Energiapuu on tärkeä osa puumarkkinoita Suomessa. Tavoitteena on esitellä metsänomistajalähtöisen energiapuun toimitusketjua Suomessa. Aineisto kerättiin kyselyllä metsänhoitoyhdistyksille (6/2021) ja hyödyntäen tilastoaineistoja.

Tulokset:

•Rankapuu arvioitiin tärkeimmäksi energiapuulajiksi

•Metsänhoitoyhdistyksien energiapuun toimitusketjun tärkeimmiksi osiksi arvioitiin markkinoinnin organisointi metsänomistajille (89%) ja korjuu tienvarteen (89%). Energiapuun organisointi terminaalivarastoihin (59%) ja haketuksen organisointi (51%) arvioitiin pienemmäksi osaksi metsänhoitoyhdistyksien energiapuun toimitusketjua

•Yleisin energiapuun organisoinnin toimintamalli metsänhoitoyhdistyksissä on oman korjuupalvelun hyödyntäminen (76%), kun taas yhtiöpohjainen toimintamalli (14%) tai yhteistyömalli (8%) eivät olleet niin yleisiä

•Energiapuun korjuun kustannukset nuorissa metsissä arvioitiin olevan suurin syy, joka estää saavuttamaan energiapuun toimituksien tavoitemääriä

•Energiapuun tarpeen arvioitiin kasvavan johtuen muutoksista energiamarkkinoilla. Tämä vuonna turpeen käytön vähentämisen arvioitiin lisäävän energiapuun käyttöä.

Johtopäätökset:

•Energiapuun kustannustehokkaiden korjuumenetelmien kehittäminen oleellista nuorissa metsissä

•Metsänhoitoyhdistyksien rooli on ollut enemmän energiapuun toimitusketjuien alkupäässä

Practice "abstract" 6:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Hybrid solution to ensure energy self-sufficiency in a berry farm

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The berry farm "Sinikasvis LP" located in Sukeva, Finland, has invested into a hybrid renewable energy solution consisting of a solar photo-voltaic (PV) installation (30 kW) and a wood gasification unit (110 kW) for combined heat (80 kW) and power (30 kW) production from wood chips.
The hybrid solution takes into account the seasonal variations in the energy consumption of the berry farm. The solar PV-system produces electricity for the freezers during spring and summer time, when the gasification unit is out of use. The operation of the gasification unit starts in the late summer when the berry season reaches its peak, thus increasing the power and heat demand for freezing and drying the berries. Heat is also used for drying the wood chips, which are used as a fuel for the gasification unit. The chips must have a moisture content below 10% for optimal operation of the gasification process. The gasification unit operates annually approximately eight months, as it also supplies heat for the buildings of the farm during the winter time.
The wood chips for the gasification unit are obtained from the own forests of the farmer. The farmer has calculated that the economical value of the wood is higher when applied for own energy production in the farm when compared to selling the wood to the domestic pulp and paper industry. An important driver for the purchase was also the investment grant obtained from the Centre for Economic Development, Transport and the Environment in Finland.

Short title in native language

Hybridiratkaisu takaa marjatilan energiaomavaraisuuden

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Sukevalla sijaitseva marjantuotantoon ja -jalostukseen keskittynyt Sinikasvis Ky on investoinut uusiutuvan energian hybridiratkaisuun, joka koostuu aurinkopaneelijärjestelmästä (30 kW) sekä puukaasutustekniikkaa hyödyntävästä CHP-laitoksesta (110 kW), joka tuottaa sähköä (30 kW) ja lämpöä (80 kW) korkealla hyötysuhteella puuhakkeesta.
Hybridiratkaisussa on otettu huomioon tilan vuodenajoista riippuva energiankulutuksen vaihtelu. Aurinkopaneeleilla tuotetaan mm. marjojen pakastukseen tarvittavien kylmälaitteiden kuluttamaa sähköä keväällä ja kesällä, kun CHP-laitos on poissa käytöstä. Puukaasulaitos käynnistetään kesän lopulla marjasesongin kiihtyessä, kun sähkön- ja lämmöntarve marjojen pakastusta ja kuivausta varten lisääntyy. Laitoksen tuottamaa lämpöä käytetään myös puuhakkeen kuivauksessa, sillä hakkeen kosteuden tulee olla alle kymmenen prosenttia kaasutuslaitoksen optimaalista toimintaa varten. Puukaasulaitosta pidetään käynnissä noin kahdeksan kuukauden ajan, jolloin sen tuottamaa energiaa hyödynnetään myös talviaikaan tilan rakennusten lämmittämisessä. Puukaasulaitoksessa käytetty puuhake saadaan yrittäjän omasta metsästä. Sinikasviksella on laskettu, että omalle puulle saadaan luotua parempi taloudellinen arvo, kun se hyödynnetään omassa energiantuotannossa verrattuna siihen, että se myytäisiin kotimaassa eteenpäin esimerkiksi kuitupuuna tai rankahakkeena. Puukaasulaitosinvestoinnissa tärkeänä tekijänä oli myös ELY-keskukselta saatu investointituki.

Practice "abstract" 7:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Manure-powered milk logistics

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Valio is a Finnish dairy and food manufacturer owned by 4,700 milk producers around Finland. Valio aims to achieve carbon neutral milk production by 2035. One solution to reduce the carbon footprint of milk is biomethane production from cow manure generated in the dairy farms. The produced biomethane can substitute fossil-based fuels in Valio's logistic chain, such as in milk trucks. Vuorenmaa dairy farm located in Haapavesi, Finland, produces milk for a local cheese factory owned by Valio. For over a decade, Vuorenmaa farm has been producing biogas from cow manure to generate the electricity and heat needed by the farm. As for 2021, Vuorenmaa farm is the first dairy farm of Valio, where biogas is also converted to compressed biomethane and can also be used as a transportation fuel.

The annual biogas yield of the farm is around 1,200 MWh of which approximately half is refined to biomethane. A milk truck in Valio's logistic chain has committed to buy biomethane produced at the farm. The truck fills up its tank while it collects the milk. A guaranteed demand and market is essential for the cost-effective production of biomethane. Private passenger cars are also able to buy biomethane from the Vuorenmaa farm.

The dairy farm can benefit from biogas and biomethane production in several ways. The electricity and heat produced from biogas increase the energy self-sufficiency of the farm, while biomethane production creates new business opportunities. Biogas production also reduces the need for purchased chemical fertilizers. During the biogas process, the manure nutrients are transformed into a more soluble form in comparison to ordinary manure and are hence applicable as recycled fertilizers in the fields.

Short title in native language

Liikennekaasua maitotilalta

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Valio on suomalainen meijeri ja ruokatalo, jonka omistaa 4 700 maidon tuottajaa ympäri maata. Valio tähtää hiilineutraaliin maidontuotantoon vuoteen 2035 mennessä. Yhtenä ratkaisuna maidontuotannon hiilijalanjäljen laskemiseksi on Valion maitotilojen lehmien lannasta tuotettu biometaani, joka korvaa fossiilista dieseliä yhtiön logistiikkaketjussa, kuten maitoautoissa. Haapavedellä sijaitseva Vuorenmaan tila tuottaa maitoa Valion juustolaan. Vuorenmaan tilalla lehmien lannasta on tuotettu biokaasua maatilan omaksi sähkö- ja lämpöenergiaksi yli vuosikymmenen ajan. Vuonna 2021, Vuorenmaan tila on Valion ensimmäinen maitotila, jossa biokaasusta tuotetaan myös liikennekäyttöön soveltuvaa paineistettua biometaania. Tila tuottaa biokaasua noin 1 200 MWh vuodessa, josta noin puolet jalostetaan biometaaniksi. Valion logistiikkaketjussa toimiva maitoauto on sitoutunut tankkaamaan tilalla tuotettua biometaania. Tankkaus onnistuu samalla, kun maitoauto hakee tilalta maitoa. Taattu kysyntä ja markkinat tuotetulle biometaanille ovat erittäin tärkeitä biometaanin tuotannon kannattavuudelle. Myös yksityisautot voivat tankata biometaania Vuorenmaan tilan julkiselta tankkausasemalta.
Maatilat voivat hyötyä biokaasun ja biometaanin tuotannosta usein eri tavoin. Biokaasusta tuotettu sähkö- ja lämpöenergia lisäävät tilan energiaomavaraisuutta, ja myytävä liikennekaasu mahdollistaa tilalle uuden tulovirran. Biokaasun tuotantoprosessin yhteydessä lannan sisältämät ravinteet saadaan myös muutettua pelloille paremmin liukenevaan muotoon. Näin lannan sisältämät ravinteet saadaan kiertolannoitteena paremmin talteen ja väkilannoitteiden ostotarve vähenee.

Practice "abstract" 8:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

An example of microgeneration in Italy

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Cip Calor Ltd is a small forest company (with 4 employees) based near Lake Como in the Central Italian Alps. In 2010 the company created a Biomass Trade Center, where the owners of wood stoves, fireplaces and chip-fed heating plants could find all the fuel they needed. Confronted with the need of producing a variety of wood fuels, Cip Calor decided to get into biomass quality sorting and improvement. An essential element of this new strategy has been the wood gasifier, commissioned in 2013 (a classic German-built Spanner plant) and funded with dedicated state incentives. This consists of two 45 kWe modules (gasifier + endothermal engine and generator), plus the drying and screening unit. Cip Calor has decided to build and manage this plant, in order to capture a larger share of the added value in forest fuels, while finding a viable outlet for the less valuable component of their annual harvest.
After more than 7 years in operation, Cip Calor are happy with their decision, which has accrued >20% ROI (return on investment). In fact, this is just one example for the growing a number of logging contractors who have integrated their business vertically into the value chain, so as to capture a larger proportion of the transformation benefits. Many more have joined Cip Calor, each devising their own creative way to make the most of the opportunity offered by diffused microgeneration.

Short title in native language

Un esempio di microgenerazione in Italia

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Cip Calor Srl è una piccola azienda forestale (con 4 dipendenti) con sede vicino al Lago di Como che nel 2010 ha creato una Piattaforma di Biomasse, dove i proprietari di stufe a legna, caminetti e cippato potevano trovare il combustibile che cercavano. Di fronte alla necessità di produrre diverso tipo di materiale, Cip Calor ha deciso di dedicarsi a migliorare la qualità della biomassa. Per far ciò è stato costruito un gassificatore a legna, commissionato nel 2013 (un classico impianto Spanner di costruzione tedesca), e finanziato grazie a appositi incentivi statali. Si compone di due moduli da 45 kWe (gassificatore + motore endotermico e generatore), più l'unità di essiccazione e vagliatura. E' stato possibile realizzare questo impianto anche grazie a incentivi statali dedicati. Cip Calor ha deciso di costruire e gestire questo impianto al fine di dare un valore aggiunto al materiale combustibile, trovando allo stesso tempo uno sbocco per la componente meno pregiata del proprio raccolto di legna annuale. Dopo più di 7 anni di attività, l'azienda è soddisfatta: ha accumulato un ROI (ritorno sull'investimento) >20%. In realtà, questo è solo un esempio per il crescente numero di aziende di legname che hanno integrato la propria attività verticalmente, in modo da ricavare una percentuale maggiore grazie ai benefici della trasformazione. Molti altri hanno seguito Cip Calor, ognuno ideando il proprio modo creativo per sfruttare al meglio le opportunità offerte dalla microgenerazione.

Practice "abstract" 9:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

The large and concentrated availability of the orchard as an energy resource

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Orchard termination residues (stems and rootstocks) are used by the Mombracco Energy Ltd 1 MWe biomass-fed power station based on the ORC technology (Turboden system). The company devised a cost-effective solution to move the resource to the plant, which requires four specific actions: cutting the above-ground tree portion; chipping it and taking the chips to the plant; digging up the rootstocks; cleaning and grinding them. and taking the resulting ground product to the plant. A dedicated technology has been developed for each of those actions, which are fully mechanized, with much benefit in terms of productivity, efficiency and operator safety. The machine (developed by Pezzolato Inc.) used for grinding the rootstocks is an innovative tub crusher specifically designed for orchard work. It is light, cheap and designed for connecting to a powerful farm tractor. It features important technical innovations, such as: a high-torque shredder and an integral star screen. The complete operation consists of the crusher and the tractor, a mini-excavator to feed the crusher and two tractors with their respective 8-t bin trailers, plus the four operators. Overall, the orchard residue recovery operation set up by the company is remarkably efficient and allows cleaning the fields at a profit, rather than a cost.

Short title in native language

La grande e concentrata disponibilità dei frutteti come risorsa energetica

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Mombracco Energy Srl gestisce una centrale elettrica a biomassa da 1 MWe basata sulla tecnologia ORC (sistema Turboden) che utilizza efficientemente gli scarti delle potature e degli espianti dei frutteti. La sfida principale era trovare una soluzione economicamente vantaggiosa per trasportare tale biomassa all'impianto, che richiede quattro fasi specifiche: taglio del tronco della pianta; cippatura e trasporto; estrarre le radici; pulirle, triturarle e trasportarle all'impianto. Per ciascuna fase è stata sviluppata una tecnologia dedicata, completamente meccanizzata, con grandi vantaggi in termini di produttività, efficienza e sicurezza. La macchina (sviluppata da Pezzolato Inc.) utilizzata per la triturazione delle radici è innovativa e appositamente studiata per questo tipo di materiale. È leggera, economica, progettata per essere collegato a un potente trattore agricolo e presenta importanti innovazioni tecniche: possiede una potente azione di taglio e incorpora un vaglio a stella integrato. Il sistema di lavoro è composto dal trituratore con la sua motrice, un miniescavatore per alimentare il trituratore e due trattori con i rispettivi rimorchi per insilato da 8 t, più quattro operatori. Nel complesso, l'operazione di recupero dei residui di frutteto messa in atto dall'azienda è notevolmente efficiente e consente di trasformare il materiale di scarto in profitto, piuttosto che con un costo.

Practice "abstract" 10:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Prototype to collect vineyard pre-pruning biomass

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Currently, vineyard pruning residue is burned in the field or chipped and integrated into the soil. The prototype developed aims to trigger a change on the pre-pruning operational mode by means of the innovation based on a new system which integrates the pre-pruning system and the collection of the biomass produced, a higher size reduction and storage in a container or trailer that will allow to recover and valorize this resource. The final prototype has been developed based on previous prototypes that have been improved.
Based on the results achieved on the field trials carried out, in which the prototype was attached to the vineyard pruning machine, the quantity of material collected after the pre-pruning reached 75 % therefore only 25 % of the material is left in the field. The average operating rate is around 1.15 ha/h. The product obtained has a moisture content of 45 % and a bulk density around 205 kg/m3(wb).
The equipment selling price is approximately around 20.000-30.000€. Considering the average productivity and taking into account the cost, service companies could sell the product at around 36€/t. If only the new equipment depreciation is taken into account (not the vineyard pruning machinery) the selling price could range around 11€/t.
The new equipment developed can significantly contribute to increase the sustainability and profitability of vineyard management.

Short title in native language

Prepoda de vid para uso como biomasa

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

En la actualidad, en términos generales, el sarmiento generado en la prepoda y poda se quema o se adiciona al campo. El prototipo desarrollado pretende generar un cambio en la práctica agronómica de la prepoda a través de la innovación con un sistema que integra al sistema de prepoda un sistema de recogida de la misma, un mayor triturado y almacenado en un contenedor/remolque lo que permitirá su valorización con fines energéticos.

El prototipo final se ha desarrollado a partir de las variacio-nes y mejoras efectuadas sobre anteriores prototipos diseñados. Las pruebas de campo realizadas con el prototipo acoplado a la vendimiadora han permitido cuantificar la recogida del material resultante de la prepoda que asciende a un 75 % de forma que solamente queda rechazado entre los alambres y el suelo el 25 % y la velocidad media de operación es de 1,15ha/h. El producto obtenido tiene una humedad en torno al 45 % humedad y una densidad alrededor de 205 kg/m3 (b.h.). El precio de venta del equipo rondaría aproximadamente los 20.000-30.000€.

Teniendo en cuenta las productividades promedio y considerando todas las amortizaciones, las empresas de servicio podrían vender el material a 36€/t aproximadamente. Si únicamente se tiene en cuenta la amortización del prototipo (y no la vendimiadora), el precio de venta podría oscilar en torno a 11€/t.

Con este prototipo de prepodadora se conseguirá una mejora de la sostenibilidad y rentabilidad en el manejo agronómico de la vid.

Practice "abstract" 11:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Olive cake gasification

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The technology developed by Bioliza shows a great potential for the olive and pomace oil sector. More concretely, gasification technology allows to use the fatty dried pomace in order to obtain heat that can be used in the oil extraction process, as well as electricity and other by-products such as biochar. This innovative practice has already been implemented in a pilot plant at Aceites Guadalentín, located in Jaém (Spain).
The technology can be used in a wide range of agro-industries that manage biomass and consume heat and electricity, due to its modularity. The system is suitable for industries with an installed power lower than 1 MWe, operating around 10 to 11 months per year. This plant can reach high efficiency levels (> 75 %) because it recovers thermal energy from the engine cooling and exhaust systems. The plant can manage 7,500 tonnes of residue per year. The outputs are: heat, syngas (burned for electricity) and a blend of ash and biochar that can be used as soil improver.
The main components of the plant include a feeding system, a gasifier, a gas cleaning, cooling and treatment system, an endothermal engine and an alternator. Operational cost is 0.01 €/kWh for the engines and around 45.000 €/year for the gasification system. Regarding the personnel needed, just one operator per shift is needed.
Such project requires a total investment of around 2.5 M€, but the payback period should be reached in 5 to 7 years with an IRR of 10-12 %. The initiative profitability will be highly affected by the total investment, the supply characteristics, the biomass cost, the operation and maintenance costs, the electric energy savings, the taxes and the income obtained from the electricity sale.

Short title in native language

Gasificación orujillo

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

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Esta tecnología tiene un gran potencial para industrias del sector del aceite de oliva y de orujo. En concreto la tecnología de gasificación permite utilizar el orujo graso seco, y obtener calor para la almazara, electricidad y subproductos como el biochar. Esta práctica innovadora ya cuenta con un piloto en marcha, en Aceites Guadalentín, Jaén (España).

Este sistema es apto para una gran variedad de agroindustrias generadoras de biomasa y consumidoras de energía térmica y eléctrica debido a su modularidad, como es el caso de instalaciones con una potencia instalada inferior a 1 MWe funcionandol alrededor de 10-11 meses al año. Este tipo de planta puede alcanzar una elevada eficiencia energética (>75 %) al aprovechar la energía térmica residual procedente de la refrigeración y el escape de los motores. La planta de Aceites Guadalentín puede gestionar 7.500 t anuales, y a la salida se obtiene syngas y una mezcla de cenizas y biocharcuyo destino puede ser la mejora de los suelos.

Los principales elementos de la planta incluyen un sistema de alimentación, un gasificador, un sistema de limpieza y tratamiento del gas y un grupo.

Los costes de operación son de 0,01 €/kWh para los motores y del orden de 45.000 €/a para el sistema de gasificación. En cuanto a personal, una persona por turno sería suficiente. Para un proyecto con estas características la inversión total puede rondar los 2,5 M€, la rentabilidad económica debería alcanzarse en un periodo de 5 a 7 años con un TIR del 10-12 %. Los principales parámetros que condicionan dicha rentabilidad en almazaras son: inversión total, características del suministro, el coste de la biomasa, costes de operación y mantenimiento, peajes, ahorro de energía eléctrica alcanzado e ingresos por venta de energía eléctrica.

Practice "abstract" 12:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Boom corridor thinning - a harvester's working method for young dense stands

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

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Boom corridor thinning (BCT) is a harvester's working method for young stands. In
BCT, trees are harvested in corridors from the strip road, with a length corresponding to the reach of the harvester crane (about 10 m) and a width
and density depending on the stand structure. In the
Nordic countries, forests are usually thinned using selective thinning from below
(ST), which consist in selectively removing trees that lack in size, quality or health.
Compared to the ST, the advantage of BCT is that the harvester work is faster and smoother, and has a larger potential for automation. In contrast, ST requires constant care to avoid release trees surroundid the individual target trees, which greatly slows down all crane movements. In Sweden, in actual test cuttings
of dense small-diameter first thinning, the productivity of BCT was 15% higher than
in ST. In Finland, in pulp wood first thinnings with bigger stem volume of removal, BCT reached its best productivity levels with a productivity increase of 44% compared with ST.
After BCT, the number of stems per hectare is higher and the stand structur is not as even as with ST; however, the number of future crop trees is the same.
According to the latest study by Nuutinen et al. (2021) the saw log volume per hectare
is the same for BCT and ST, provided that the intermediate thinnings are made with selection criteria. That is: the intermediate thinning will

Short title in native language

Väyläharvennus – menetelmä nuorten metsien ensimmäiseen

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Väyläharvennus on pienipuustoisen nuoren metsän koneellinen hoito- ja puunkorjuumenetelmä, jossa puut kaadetaan ajourilta käsin työskentelyväyliltä jättäen väylien väliset alueet käsittelemättä. Väyläharvennuksen etu perinteiseen valikoivaan harvennustapaan on väylässä, jossa hakkuulaite pystyy liikkumaan sujuvammin ja ripeämmin, koska kasvamaan jätettäviä puita ei tarvitse varoa läheskään yhtä paljon. Käytännön testihakkuissa ensiharvennuksissa pienipuustoisen energiapuumetsikön väyläharvennuksessa tuottavuus oli 15 % suurempi kuin valikoivan harvennuksen. Vastaavasti järeämpipuustoisissa ainespuumetsissä päästiin suurimmillaan 44 %:n tuottavuushyppyyn. Väyläharvennus onnistuu tehokkaasti hoitamattomissa ylitiheissä nuorissa metsissä ilman ennakkoraivausta, mikäli ainespuun rinnalla kerätään joukkokäsittelevällä hakkuulaitteella myös pieniläpimittainen energiapuu. Tällöin sopivalla kohteella väyläharvennus tarjoaa haluttaessa hyvän lähtökohdan jatkuvalle kasvatukselle ja samalla säästetään ennakkoraivauksen kustannus (noin 300 €/ha). Väyläharvennuksen jälkeen metsä on tiheämpi ja erirakenteisempi, mutta kasvatettavien valtapuiden tiheys on silti samalla tasolla kuin valikoivassa harvennuksessa. Väyläharvennettujen puustojen ryhmittäisyys tasoittuu ja metsikön tukkipuusaanto pysyy samalla tasolla valikoivan harvennuksen kanssa, mikäli seuraavat harvennukset tehdään valikoivalla harvennuksella.

Practice "abstract" 13:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Conversion of organic residues to proteins for animal feed through insects and modular production site

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

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- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Organic residues from agriculture are processed by larvae of the soldier fly; proteins and other products are obtained from the larvae.

Regional cycles are created, as organic residues do not have to be transported far. Insects make it easier to separate organic from non-organic waste. Farmers can partially cover their animal feed needs with the proteins produced by the process, instead of having to import them.

Such a production facility is independent of location and climate, has a modular structure (container system) and initially requires a relatively small investment. The use of globally available shipping containers means that the production facility always has the same basic dimensions.

It is easy to integrate decentralised production facilities into an ongoing agricultural operation. The technical equipment (e.g. forklift trucks) and the requirements for staff are partly the same as those of an agricultural operation. Any vacancies in rural areas can be successfully re-used. Production is possible at various levels of automation, adapted to local conditions.

The production facility requires hot water as an energy source and can be operated synergistically with waste heat, e.g. from a biogas plant.

Short title in native language

Umwandlung von organischen Reststoffen in Proteine für den

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
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Organische Reststoffe der Landwirtschaft werden von Larven der Soldatenfliege verarbeitet, aus den Larven werden Proteine und weitere Produkte gewonnen.

Es entstehen regionale Kreisläufe, da organische Reststoffe nicht weit transportiert werden müssen. Insekten ermöglichen die bessere Trennung von Abfällen in Organik von Nicht-Organik. Die Landwirt:innen können mit den produzierten Proteinen ihren Futtermittelbedarf teilweise decken anstatt diesen durch Importe gewährleisten zu müssen.

Eine solche Produktionsstätte ist standort- und klimaunabhängig, modular aufgebaut (Containersystem) und bedarf anfänglich einer relativ geringen Investition. Die Verwendung von weltweit verfügbaren Schiffscontainern gestaltet die Produktionsstätte in immer gleichen Grundmaßen.

Es ist leicht, dezentrale Produktionsstätten in einen laufenden landwirtschaftlichen Betrieb zu integrieren. Die technische Ausstattung (z.B. Gabelstapler) und die Anforderungen an das Personal entsprechen teilweise denen eines landwirtschaftlichen Betriebs. Eventueller Leerstand in ländlichen Gebieten kann erfolgreich nachgenutzt werden. Die Produktion ist in verschiedenen standortangepassten Automatisierungsstufen möglich.
Die Produktionsstätte benötigt Warmwasser als Energieträger und kann synergetisch mit der Abwärme z.B. von einer Biogasanlage betrieben werden.

Practice "abstract" 14:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Hydrothermal carbonization of biomass

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

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Ingelia is a company dedicated to the commercialization of a hydrothermal carbonization (HTC) technology, equipment and installations to treat biomass and organic residues at an industrial scale. In 2010, they built an HTC plant in Valencia to process organic residues in a continuous operation mode to demonstrate the feasibility of the technology. In 2015, a second reactor was installed.

The technology allows to concentrate the energy content of the input biomass into a solid biofuel (around 24 MJ/kg) and to produce fertilized water. The input can be almost any type of wet organic residue, such as the organic fractions of urban residues, sewage sludge, agro-forestry residues, agri-food residues or prunings.

During the HTC process, the wet biomass is carbonized into biocoal. The product is then refined to remove impurities such as metals, stones or glass, and then dried. Finally, a powered biocoal that can undergo pelletizing or briquetting is obtained. The process also allows to extract biochemical compounds from some of the biomass/residues.

The reactors are modular, with a processing capacity between 5000 and 10000 t/year each, and the number of reactors can the adapted according to the project needs.

The biocoal obtained has many advantages such as a competitive market price, homogeneity regardless of the input biomass and a heating value increased by 30 % when compared to conventional pellets. The product is also hydrophobic, and easy to transport and store. Therefore, it is a renewable product that can substitute fossil-based coal in different applications (e.g., thermal and metallurgy) while contributing to decrease GHG emissions. The liquid fraction produced can be used for irrigation purposes (parks, gardening or agriculture).

Short title in native language

Carbonización hidrotermal de biomasa

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

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- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Ingelia es una empresa dedicada al suministro de tecnología, equipos e instalaciones de Carbonización Hidrotermal (HTC) de biomasa y residuos orgánicos a escala industrial. El año 2010 construyó en Valencia una planta de HTC capaz de procesar residuos orgánicos en continuo, demostrando así la viabilidad de la aplicación industrial de esta tecnología. El año 2015 instaló un segundo reactor.

El proceso permite concentrar el poder energético de la biomasa de origen en un biocombustible sólido (alrededor de 24 MJ/kg) y generar un agua con efecto fertilizante. La materia prima puede ser casi cualquier tipo de residuo orgánico húmedo (FORSU, lodos, residuos agroforestales o agroalimentarios, podas, etc.). Durante el proceso HTC, la biomasa húmeda se carboniza transformándose en biocarbón. El producto se refina (eliminando impropios tales como metales, piedras, cristales, etc.) y se seca. Al final del proceso se obtiene un biocarbón en polvo que se puede pelletizar o briquetear. El proceso también permite extraer compuestos bioquímicos de algunas biomasas/residuos. Los reactores HTC son modulares, con una capacidad de tratamiento de entre 5.000 y 10.000 ton/año por reactor y el número de reactores se ajusta para cada proyecto.

El biocarbón obtenido presenta un precio de mercado competitivo, es relativamente homogéneo, tiene un 30% más de poder calorífico que los pellets convencionales, es hidrófobo, fácilmente transportable y almacenable. Es un producto renovable, que puede sustituir al carbón mineral en diversas aplicaciones (térmica, alternativa al coke para el sector metalúrgico, etc.) y no contribuye a las emisiones de GEI. El efluente líquido es un producto que puede ser reutilizado para riego de parques, jardines, agricultura, etc.

Practice "abstract" 15:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Biomass torrefaction and cleaning

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

CENER has developed a technology to produce reliable and competitive solid biofuels from cheap residual biomass (agricultural residues, forest residues, etc.) with high chlorine and potassium contents. The product is focused on the decarbonization of industrial sectors with intensive thermal energy consumption. The technology combines torrefaction of residual biomass with processes seeking to remove unwanted inorganic elements and the use of additives to improve the high temperature behavior of the mineral fraction. The result is a solid biofuel with high calorific value, very high energy density, low energy demand to perform the milling therefore generating a very low particle size distribution, low level of emissions (aerosols) and a high ash melting temperature. Production cost is in the range of 27-30 €/MWh.

Through the integrated combination of different technologies, the following results have been achieved with wheat straw residues:

• Reduction of 67 %, >95% and 57% in the content of Potassium, Chlorine and Sulphur, respectively (perecnt based on the energy content of the fuel; that is, in mg/kWh).

• 20% increase in the energy content of the product, in terms of net calorific value (up to 20 MJ/kg). If the energy density of the product (MWh/m3) is also considered, then the increase reaches by 700 % reaching approximately 3.9 MWh/m3 which has a very positive impact on logistics costs.

• The fusibility of the bottom ash from the boiler increases by + 300ºC until it reaches values above 1,100ºC, thus matching the behavior of woody biomass.

• Reduction of 70% in the volatilization of KCl.

Short title in native language

Limpieza y torrefacción de biomasa residual

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

CENER ha desarrollado una tecnología para producir biocombustibles sólidos fiables y competitivos a partir de biomasa residual barata (residuos agrícolas y forestales, etc.) con alto contenido de cloro y potasio. El producto está enfocado a la descarbonización de sectores industriales intensivos en consumo de energía térmica. La tecnología combina la torrefacción de biomasa residual con procesos para la eliminación de elementos inorgánicos no deseados y el uso de aditivos que mejoran el comportamiento a alta temperatura de la fracción mineral. El resultado es un biocombustible sólido con alto poder calorífico, muy alta densidad energética, con baja demanda energética para la molienda generando una distribución de tamaño de partícula muy baja, bajo nivel de emisiones (aerosoles) y una alta temperatura de fusión de cenizas. Los costes de producción están en el rango de 27-30 € / MWh.

Mediante la combinación integrada de diferentes tecnologías, se han obtenido los siguientes resultados con los residuos de paja de trigo:

• Reducción del 67% del contenido de potasio (basado en el contenido energético del combustible; es decir, en mg / kWh),> 95% en el caso del cloro y 57% en el caso del azufre.

• Incremento del contenido energético del producto, en términos de poder calorífico neto del 20 % hasta 20 MJ / kg. Si también se considera la densidad energética del producto (MWh / m3), aumenta en un 700 % hasta aproximadamente 3,9 MWh / m3. En consecuencia reflejando un impacto muy positivo en los costos logísticos.

• La fusibilidad de las cenizas de fondo de la caldera aumenta en + 300ºC hasta alcanzar valores superiores a los 1.100ºC, igualando así el comportamiento de la biomasa leñosa.

• Se han obtenido reducciones del 70% en la volatilización de KCl.

Practice "abstract" 16:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Cleaning system for vineyard prunnings

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The main constraint to use the vineyard pruning for energy purposes is the high ash content (around 20 %), which is highly dependent of the equipment performing the pruning and collecting since during these operations a high percentage of impurities such as sandstones, metals, stones, plastics are incorporated. The equipment developed by ATHISA (patent ES2606774) allows to reduce the ash content up to 3 %. It is therefore an equipment that would allow vineyard cooperatives and wineries to use pruning for energy purposes but also agricultural services companies and biomass supplier could benefit from it.
The equipment operation is based on a density in wet conditions separation process in two phases using as input the vineyard pruning chipped. It is a cleaning and washing continuous process consisting of two units in-line. The high-density separation and decanting unit is equipped with a water filtration system, as well as a tilting system to discharge impurities. Furthermore, the sandstone and soil cleaning system, is a rinsing system equipped with a membrane filter.
The equipment is able to process 50000 tonnes of raw vineyard pruning with an averagea yield of 14 t/h, obtaining 40000 tonnes of vineyard pruning with a heating value around 19.12 GJ/t and ash content lower than 3 %.
The investment required ranges from 300000-500000 € and operation cost imply between 3 to 10 €/t.
The vineyard pruning can be used as industrial pellet (10 mm) or baled chip in thermal and electricity companies located at significant distances (even to export) and bulk chips for the thermal and electricity companies located in the surrounding area.

Short title in native language

Equipo de Limpieza y Valorización del sarmiento de la vid

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

El principal condicionante para el aprovechamiento del sarmiento de vid con fines energéticos es su elevado contenido en cenizas (≈20 %), que viene en gran medida determinado por las prácticas de poda y recogida realizadas con el sarmentador al incorporar areniscas, piedras, metales y plásticos. El equipo desarrollado por ATHISA (patente ES2606774) permite reducir el contenido de cenizas por debajo del 3 %. Se trata por tanto de un equipo que permitiría a cooperativas vitivinícolas y bodegas aprovechar la poda de las vides pero también a empresas de servicios agrícolas que gestionan podas y arranques y gestores de biomasa.

El funcionamiento del equipo se basa en el principio de separación por densidad en medio húmedo en dos fases partiendo del sarmiento bruto astillado. Se trata de un proceso continuo de limpieza y enjuague, compuesto por dos unidades en línea. La unidad de separación de elementos de alta densidad está dotada de un sistema de filtración de aguas y decantación, así como de un sistema basculante de descarga de impropios. Por otro lado, la unidad de limpieza de areniscas y tierras adheridas, se trata de un sistema de enjuague dotado de un filtro de membranas.

Este equipo es capaz de procesar 50.000 toneladas de sarmiento bruto con un rendimiento medio de 14 t/h, obteniendo 40.000t de sarmiento valorizado con un Poder Calorífico de 19,12 GJ/t y unas cenizas inferiores al 3 %.

La inversión en función del modelo oscila entre 300000-500000 € y unos costes de operación de 3-10 €/t.

Esta biomasa valorizada de sarmiento puede utilizarse como pellet industrial (10 mm), como astilla alpacada para industria térmica y eléctrica a grandes distancias (incluso en exportación) y como astilla a granel para la industria térmica y eléctrica de proximidad.

Practice "abstract" 17:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Straw mobile pellets harvester

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Krone Premos 5000 is a mobile pellet harvester that produces pellets as it collects the stalks from the swath or other agriculture residues to be used as fodder, bedding and fuel in a biomass boiler or biogas production.
During the pelleting temperatures around 95-100°C and pressures of up to 2,000 bar are reached allowing to produce long lasting pellets. Pellets obtained have a bulk density around 650-700kg/m³ similar to woody pellets and a moisture content around 8 %.
Premos 5000 has a hopper capacity of 5,000 kg and can reach a yield up to 5,000 kg/h. Once produced, the pellets are then conveyed by a belt to a trailer which hauls them directly to the retail customers or to Premium Pellet Spain plant as supplier of these type of pellets.
Premos is able to produce pellets according to individual requirements simply by modifying the amounts of water or vegetable oil added. Aditionally, there are further options to control the size of pellets by adjusting the scraper to obtain pellets 2-6 cm long. Nevertheless, the diamter is fixed, 16 mm, twice the usual since no milling process takes place previous to the pelletizing.
It is a biofuel that can significantly contribute to increase the energy savings in rural areas. Additionally, this innovative system allows to avoid energy-intensive pre-treatments (bailing, bales transport, feeding, milling, drying). In fact, the energy demand is just half the demand required by a stationary pelleting system. In summary, the mobile pellet harvester developed could contribute to simplify the value chain.

Short title in native language

Not available

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

La Krone Premos 5000 es una empacadora de paja, forraje y otros residuos agrícolas que los convierte directamente en pellets para su uso como cama de ganado, pienso o como combustible en calderas de biomasa o producción de biogás.
Durante el peletizado se alcanzan temperaturas cercanas a 95-100ºC y presiones de hasta 2.000 bares lo que permite que el material forme pellets duraderos. La densidad aparente de los gránulos se encuentra entre 650 y 700 kg/m³ similar a la del pélet madera y una humedad en torno al 8 %.
Premos 5000 dispone de una tolva con un capacidad de hasta 5.000 kg y alcanza un rendimiento de hasta 5.000 kg/h. Una vez producidos, los pelets se cargan a través de una cinta transportadora en el trailer que los distribuye al cliente final o los lleva a las instalaciones de Premium Pellets Spain como distribuidor de estos pellets.
Premos es capaz de producir pellets acorde a las necesidades individuales modificando la cantidad de agua o aceite vegetal que se añaden. Además cuenta con sistemas adicionales de control para adaptar la longitud del pellet, ajustando el sistema de corte entre 2-6 cm. Sin embargo el diámetro es fijo, 16 mm, casi el doble del habitual debido a que no se realiza un proceso previo de molienda.
Se trata de un material que puede suponer un ahorro energético muy importante para su uso en zonas rurales. Además, este innovador sistema permite ahorrar el gasto energético asociado a la etapa de pretratamiento (empacado, transporte de las pacas, alimentación, molienda, secado). De hecho, la demanda de energía es la mitad de la que requiere un sistema estacionario de peletizado. En definitiva, se trata de una maquina que puede contribuir a simplificar la cadena de valor.

Practice "abstract" 18:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Agricultural cooperative biogas plant

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

A partnership between the Theuma municiple government and the Theuma agricultural cooperative creates a supply chain of processing locally sourced agricultural residues into biogas. The biogas is utilized in combined-heat-and-power (CHP) units that sell power to the public electrical grid and provide heat to Theuma's heating grid system (approx. 115 households, public buildings, and several small businesses).
The Theuma agricultural cooperative operates on approximately 1970 ha. and produces both livestock manure and crop silage that is collected in fermentation tanks, where bacterial decomposition allows for the collection of biogas (containing approx. 55% methane). The biogas is then burned according to demand either within the biogas plant or two satellite CHP units. The remaining organic and mineral waste material after biogas production is reutilized as an agricultural fertilizer.
Technology Disadvantages:
- Sustainability advantages of biogas plants are not rewarded in electricity and heat markets
- Large investment and maintenance costs
- Requires trained personnel for operations and maintenance
Technology Advantages:
- Storable energy (supply security)
- Base-load capable (no fluctuations in energy generation)
- Demand driven
- CO2 neutral
- Independent energy source (not susceptible to outside influences)
- Decentralized and expandable utilization through satellite CHP units

Short title in native language

Landwirtschaftliche Genossenschaft Biogasanlage

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Eine Partnerschaft zwischen der Gemeindeverwaltung von Theuma und der landwirtschaftlichen Genossenschaft von Theuma schafft eine Versorgungskette für die Verarbeitung örtlicher landwirtschaftlicher Reststoffe zu Biogas. Das Biogas wird in Blockheizkraftwerken (BHWKs) genutzt, die Strom an das öffentliche Stromnetz verkaufen und Wärme für das Heizungssystem von Theuma (ca. 115 Haushalte, öffentliche Gebäude und mehrere kleine Unternehmen) liefern.
Die landwirtschaftliche Genossenschaft von Theuma bewirtschaftet ca. 1970 ha und produziert sowohl Viehdung als auch Getreidesilage, die in Gärbehältern gesammelt werden, wo durch bakterielle Zersetzung Biogas (mit einem Methangehalt von ca. 55 %) gewonnen wird. Das Biogas wird dann je nach Bedarf entweder in der Biogasanlage oder in zwei Satelliten-BHKWs verbrannt. Die nach der Biogaserzeugung verbleibenden organischen und mineralischen Reststoffe werden als landwirtschaftlicher Dünger verwertet.
Nachteile der Technologie:
- Die Nachhaltigkeitsvorteile von Biogasanlagen werden auf dem Strom- und Wärmemarkt nicht honoriert
- Hohe Investitions- und Wartungskosten
- Erfordert geschultes Personal für Betrieb und Wartung

Vorteile der Technologie:
- Speicherbare Energie (Versorgungssicherheit)
- Grundlastfähig (keine Schwankungen in der Energieerzeugung)
- Bedarfsgesteuert
- CO2-neutral
- Unabhängige Energiequelle (unempfindlich gegenüber äußeren Einflüssen)
- Dezentraler und erweiterbarer Einsatz durch Satelliten-BHKWs

Practice "abstract" 19:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Biogal - The green biogas plant in Boleszyn

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Biogal was founded in 2012 and currently employs over 40 people. The company obtains raw materials such as manure and self-grown corn from its own pig farm and from other local farmers to produce biogas. In addition, Biogal also processes agrifood industry waste products such as post-distillery brew, fruit and vegetable residues and overdue food. Biogal's activity is beneficial especially for the pig producers who do not have enough agricultural area to meet the Nitrates Directive requirements. Biogal deals with energy production from a combination of renewable sources, waste food products processing, organic fertilizer production (productized with the name Naturgal) as well as obtaining of wind and solar energy. The company is currently implementing several wind energy investments for local villages and towns.
The agricultural biogas is produced in the natural manure methane fermentation process. Naturgal is produced in the mesophilic fermentation process, and it is recommended for vegetable crops, ornamental plants, fruit trees, shrubs as well as field crops and affects both the natural beneficial development and high quality of crops. Obtained electricity and heat constitute an effective element of infrastructure development, allowing for electricity supply for Biogal's own needs, for other local farmers, residents and for public sector institutions. The heat supply is provided for 2 local factories, 3 schools, 2 churches and 350 single-family houses – the company supplies energy to 4 nearby villages and built a 27 km long heat pipeline. The constructed heating network is routed to the construction and housing elements manufacturing plant and serves for precast concrete products drying.

Short title in native language

Biogal - Ekologiczna biogazownia w Boleszynie

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

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- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Biogal powstał w 2012 r. i obecnie zatrudnia ponad 40 pracowników. Spółka pozyskuje surowce do produkcji biogazu, tj. obornik i kukurydzę, z własnej fermy trzody chlewnej oraz od innych lokalnych producentów rolnych. Ponadto, w instalacji przetwarzane są odpady przemysłu rolno-spożywczego, tj.: wywar pogorzelniany, pozostałości owoców i warzyw oraz przeterminowana żywność.
Działalność Biogal jest korzystna zwłaszcza dla producentów trzody chlewnej nieposiadających wystarczającej powierzchni upraw, aby spełnić wymagania Dyrektywy Azotanowej. Biogal zajmuje się produkcją energii w skojarzeniu OZE, przetwarzaniem odpadów spożywczych, produkcją nawozu organicznego (Naturgal) oraz pozyskiwaniem energii wiatrowej i słonecznej. Spółka jest obecnie w trakcie realizacji inwestycji w energię wiatrową dla lokalnych wsi i miasteczek.
Biogaz rolniczy Naturgal powstaje w procesie mezofilnej, naturalnej fermentacji metanowej obornika, polecany jest do upraw warzyw, roślin ozdobnych, drzew owocowych, krzewów oraz upraw polowych i wpływa zarówno na korzystny, naturalny rozwój, jak i na wysoką jakość plonów. Pozyskiwana energia elektryczna i ciepło stanowią efektywny element rozwoju infrastruktury, pozwalający
na dostawy energii elektrycznej na własne potrzeby Biogal, zapotrzebowanie innych lokalnych producentów rolnych, mieszkańców oraz instytucji sektora publicznego. Spółka zaopatruje w ciepło 2 lokalne fabryki, 3 szkoły, 2 kościoły i 350 domów jednorodzinnych – dostarcza energię do 4 pobliskich wsi i wybudowała 27 km rurociąg ciepłowniczy. Biogal wybudował sieć ciepłowniczą, która doprowadzona została do fabryki elementów budowlanych i mieszkaniowych i służy do suszenia prefabrykatów betonowych.

Practice "abstract" 20:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Biomass hybrid dryer

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

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- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

VTT's proof-of-concept biomass hybrid dryer combines solar collectors and a heat pump in an efficient and flexible way. Various drying modes, such as solar alone, pump alone or solar and pump together, can be applied, depending on the availability of solar irradiation and electricity price. The biomass hybrid dryer is economically viable especially, when the electricity is cheap. Solar energy can always be utilized to boost the drying process. The control system allows flexibility between different operating modes.

In the biomass hybrid dryer, solar collectors (24 m2) and a heat pump (25 kW max output), integrated into an air supply unit, are placed in a freight container. A parallel container serves as a drying chamber for the biomass. The pump is primarily used to remove moisture from the drying air and to provide initial heat if necessary. The dryer can be run on a solar or pump mode or on both of them. Algorithms follow the electricity price and determine which is the most economical mode to operate. If the electricity price fluctuates during the day, drying can be halted and continued when economical again. Cheap energy, whether solar or power, can be stored in dried biomass. The whole system is movable and scalable in modules.

The flexible up-take of electricity and irradiation enables cost-effective drying and storage of energy in dry biomass. The dryer effectively utilizes fluctuations in electricity prices and also enables to store intermittent solar energy into biomass. The concept suits best for rural areas such as farms and small enterprises, close to dispersed biomass sources. Fossil fuel is most often used for drying small batches of biomass. With this concept, all of the fossil fuel can be substituted with renewable alternatives.

Short title in native language

Biomassan hybridikuivuri

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

VTT:n pilottivaiheen hybridikuivurissa hyödynnetään ilmanvaihtokoneeseen integroitua ilmalämpöpumppua ja aurinkokeräimiä, joko samanaikaisesti tai valitun kuivaustavan mukaisesti erikseen, riippuen auringonsäteilyn määrästä, sähkön hinnasta ja kuivausolosuhteista. Lämpöpumppukuivaus mahdollistaa kuivauksen yöllä ja edullisen sähkönhinnan aikaan. Ohjausalgoritmeilla kuivausta voidaan ohjata joustavasti eri kuivaustapojen välillä. Kuivurin lämmöntuotanto- ja kuivausyksikön muodostavat 24 m2 aurinkokeräimet ja 25 kW (max antoteho) ilmalämpöpumppu, jotka on sijoitettu rahtikonttiin. Viereinen kontti toimii kuivauskamarina, jossa biomassa kuivataan. Lämpöpumppua käytetään pääasiassa kuivausilman kosteuden poistoon, mutta ulkoyksiköllä voidaan myös tuottaa tarvittava alkulämpö kuivausprosessiin. Algoritmeilla seurataan sähkön hintaa ja ohjataan kulloinkin edullisin kuivaustapa. Kuivaus voidaan myös pysäyttää, mikäli se ei ole taloudellisesti kannattavaa tiettyinä jaksoina. Edullinen energia, joko aurinko tai sähkö, voidaan varastoida biomassaan. Koko systeemi on skaalattavissa moduuleissa ja se voidaan siirtää helposti toiseen paikkaan. Joustava sähkön ja aurinkoenergian hyödyntäminen mahdollistaa siis kustannustehokkaan energian siirron ja varastoinnin biomassaan. Konsepti sopii parhaiten maaseudun hajautettuun kuivaukseen ja energian varastointiin lähellä raaka-ainelähdettä. Biomassan hybridikuivurin avulla maatiloilla kuivauksessa usein käytetty fossiilinen polttoaine voidaan korvata uusiutuvilla vaihtoehdoilla.

Practice "abstract" 21:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Grass factory - how to produce sustainable thermoplastic from meadow grass

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The company Biowert process meadow grass from the region as a raw material into innovative materials by a biorefinery process and green electricity by an affiliated biogas plant. It has developed fibre-reinforced thermoplastic AgriPlast for injection moulding and extrusion, which input material (granules) contain up to 75% cellulose. Digestate from the biogas plant is further processed to a biofertilizer used by local farmers. The grass fibre for the biobased-products can be fully recycled without generating waste products or waste water in an efficient closed-loop process. The facility has an annual throughput of about 2,000 t dry matter (equivalent to 8,000 t grass per year). The integrated biogas plant produces c. 1,340,000 m3 of biogas annually which is used in combined heat and power facilities, which produced 5.2 GWhel of electricity (in 2012).

Instead of depending on changing market prices of the crops, regional farmers can benefit of the increasing profits from the sale of meadow grass and provide them a secure income. The output of the cultivation of meadow grass is high because of its low input of labour, machines, fertiliser and serveral harvests per year. However, it doesn't lead to a depletion of soils like other crops, as biomass residues from the production process are returned to the field as fertiliser.

The benefit for bio-based industry is opening new market sectors in the bioeconomy with the severals characteristics of the innovative product AgriPlast. The product is light, resistant to abrasion, suitable for injection moulding and extrusion and nontoxic. The cellulose is embedded in a thermoplastic matrix that can be made out of PP, recyclates, or out of biodegradable plastics.

Towards to closed-loop manufacturing process, the company produce

Short title in native language

Wie aus Wiesengras nachhaltiges Plastik entsteht

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Die Firma Biowert verarbeitet Wiesengras aus der Region über das Bioraffinerieverfahren zu innovativen Materialien, die unter anderem in der angeschlossenen Biogasanlage zu grünem Strom produziert. Die Grasfabrik hat den grasfaserverstärkten thermoplastischen Kunststoff AgriPlast für Spritzguss und Extrusion entwickelt, dessen Ausgangsmaterial (Granulat) bis zu 75% Zellulose enthält. Die Gärreste aus der Biogasanlage werden zu einem Biodünger weiterverarbeitet, der von den Landwirten vor Ort verwendet wird. Die Grasfasern für die biobasierten Produkte können in einem effizienten Kreislaufprozess vollständig recycelt werden, ohne dass Abfallprodukte oder Abwässer entstehen. Die Anlage hat einen jährlichen Durchsatz von etwa 2.000 t Trockenmasse (entspricht 8.000 t Gras pro Jahr). Die integrierte Biogasanlage produziert jährlich ca. 1.340.000 m3 Biogas, das in Kraft-Wärme-Kopplungsanlagen genutzt wird, die 5,2 GWhel Strom produzieren (im Jahr 2012).

Die regionalen Landwirte können von den steigenden Gewinnen aus dem Verkauf von Wiesengras profitieren und sich ein sicheres Einkommen sichern, anstatt von den schwankenden Marktpreisen anderer Feldfrüchte abhängig zu sein. Der Output aus dem Anbau von Wiesengras ist hoch, weil der Einsatz von Arbeitskräften, Maschinen und Dünger gering ist und mehrere Ernten pro Jahr anfallen können. Zudem führt das Gras nicht wie andere Kulturpfalnzen zu der Auszehrung der Böden. Biomassereste aus dem Produktionsprozess des Grases kann als Biodünger auf das Feld zurückgeführt werden.

Neuen Marktbranchen der biobasierten Industrie können durch die Eigenschaften des Produkts AgriPlast erschlossen werden. Denn das Produkt ist leicht, abriebfest, für Spritzguss und Extrusion geeignet und ungiftig. Die Zellulose ist in eine thermoplastische Matrix eingebettet, die aus PP, Recyclaten oder biologisch abbaubaren Kunststoffen hergestellt werden kann.

Das gelieferte, lokale Wiesengras hat kurze Transportwege und der Ressourcenverbrauch der kreislaufbasierten Produktion ist niedrig. Insgesamt hat die Wertschöpfungskette einen geringen ökologischen

Practice "abstract" 22:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Hydrothermal carbonization of green waste to produce biocoal, carbons and biochemicals

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

SunCoal is using the hydrothermal carbonization process (HTC) to produce the high quality biocoal that is comparable to brown coal. The HTC works with pressure and heat in order to replicate the natural carbonisation process of biomass. The biocoal has a energetic value that is 70% higher than that of the starting materials. SunCoal can utilize the local green waste for biocoal and biochemicals production with low waste disposal costs. In CarboRen plant, 100 kgCO2/GJ output can be avoided at a production capacity of 17250 tonnes biocoal. Biocoals can be produced in various forms (dust, pellets, granulate). Market price for biocoals produced with HTC obtains 230€ per tonne dry matter. In a CarboREN plant, around 17,250 tonnes biocoal, equivalent to 345,000 GJ energy can be gained from 50,000 tonnes/year green waste, and 33,000 tonnes CO2 can be avoided. Due the advantage of the high feedstock flexibility from residues farmes and foresters can deliver their agricultural residues and wood waste to process them to biocoal. Fermentation for biogas and other chemicals production is possible as competitive usage. Green wastes can also be used for composting. The CarboREN process makes the use of biomass more efficient and itself is environmentally friendly, there are no harmful by-products. Technical implenentation and upscaling is challenging to realize, legal framework for the utilization of green waste is missing.

Short title in native language

Hydrothermale Karbonisierung von Grünabfällen zur Herstellung von

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

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- Main **results/outcomes** of the activity (expected or final)
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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

SunCoal setzt das hydrothermale Karbonisierungsverfahren (HTC) ein, um hochwertige Biokohle zu produzieren, die mit Braunkohle vergleichbar ist. Die HTC arbeitet mit erhöhten Druck und Hitze, bei dem Biomasse in Biokohle überführt wird. SunCoal kann die lokalen Grünabfälle für die Produktion von Biokohle und Biochemikalien mit geringen Entsorgungskosten nutzen. Hierbei hat die Biokohle 70 % höheren Energiewert als die Ausgangsstoffe und kann in verschiedenen Formen hergestellt werden (Staub, Pellets, Granulat). Die CarboRen-Anlage können 100 kgCO2/GJ bei einer Produktionskapazität von 17250 Tonnen Biokohle einsparen. Aus 50.000 Tonnen Grünabfällen pro Jahr können etwa 17.250 Tonnen Biokohle gewonnen werden, was 345.000 GJ Energie entspricht und somit eine Einsparung von 33.000 Tonnen CO2. Der Marktpreis für HTC- Kohle liegt bei 230 € pro Tonne Trockenmasse. Durch die hohen Rohstoffflexibilität für die Anlagen, können Land- und Forstwirte verschiedene landwirtschaftlichen Reststoffe anliefern, die zu Biokohle verarbeiten werden. Effektive Nutzung ist gegeben durch einerseits der Vergärung zur Produktion von Biogas und Chemikalien und andererseits durch Grünabfälle, die zur Kompostierung verwendet werden können. Das CarboREN-Verfahren ist zudem umweltfreundlich, da keine zusätzlichen schädlichen Nebenprodukte entstehen. Die technische Umsetzung und Hochskalierung der Produktion insgesamt können schwierig realisierbar sein und es fehlt der rechtliche Rahmen für Grünabfällen.

Practice "abstract" 23:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

COBRAF Project – Co-products from Biorefineries

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The COBRAF project - 'Co-products from BioRAFineries' - proposed and implemented a concrete model of bio-economy, based on products derived from 4 oil crops: camelina, hemp, safflower and flax, all characterised by high nutritional and health properties such as polyunsaturated fatty acids and many other metabolites. In the case of hemp (Canapa sativa L.), the project has shown that small-scale cultivation provides environmentally and economically sustainable products and sub-products that include flowers, seeds, hemp and fibre. The upper part of the plant contains more than 600 different chemical compounds, all of which are used in the pharmaceutical sector. The seeds can be used in animal feed, human nutrition, as supplements, and in the nutraceutical sector. Canapulus is destined for the green building market, the automotive industry, packaging and bio-based plastic composites. The fibre, on the other hand, is destined for the green building market for the production of heat-insulating and sound-absorbing mats and panels and, through innovative microbiological maceration processes, it is possible to produce macerated hemp fibre, particularly suitable for the textile and paper markets. In the last five years, the world hemp market has changed radically, partly as a result of the confirmation of the health and therapeutic value of the cannabinoids contained in hemp inflorescences, such as cannabidiol (CBD). Many of the products derived from hemp, particularly those intended for pharmaceutical and food use, can have an economic knock-on effect on supply chains.

Short title in native language

progetto COBRAF – Coprodotti da Bioraffinerie

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Il progetto COBRAF – “Co-prodotti da BioRAFfinerie” - ha proposto e realizzato un modello concreto di bioeconomia, basato su prodotti derivanti da 4 colture oleaginose: camelina, canapa, cartamo e lino, tutte caratterizzate da elevate proprietà nutrizionali e salutistiche come acidi grassi polinsaturi e molti altri metaboliti. Nel caso della canapa (Canapa sativa L), il progetto ha dimostrato che la coltivazione su piccola scala fornisce prodotti e sotto prodotti ambientalmente ed economicamente sostenibili che includono fiori, semi, canapulo e fibra. I fiori contengono più di 600 composti chimici diversi, tutti utilizzati nel settore farmaceutico. I semi, possono essere utilizzati nell'alimentazione animale, nel settore dell’alimentazione umana, come integratori, e nel settore nutraceutico. Il canapulo è destinato al mercato della bioedilizia, all'industria automobilistica, agli imballaggi e ai compositi plastici a base biologica. La fibra invece interessa il mercato della bioedilizia per la produzione di stuoie e pannelli termoisolanti e fonoassorbenti e, attraverso innovativi processi di macerazione microbiologica è possibile produrre fibra di canapa macerata, particolarmente adatta al mercato tessile e cartario. Negli ultimi 5 anni il mercato mondiale della canapa ha cambiato radicalmente volto anche in seguito alla conferma del valore salutistico e terapeutico dei cannabinoidi contenuti nelle infiorescenze della canapa come il cannabidiolo (CBD). Molti dei prodotti derivati dalla canapa, in particolare quelli destinati all’uso farmaceutico e alimentare, possono avere un effetto economico trainante sulle filiere.

Practice "abstract" 24:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Biochar from lignocellulosic and agriculture residues

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Biochar production by slow pyrolysis represents an opportunity for forestry companies to diversify their income and to create new and stable business opportunities compared to typical decentralised biomass energy production. Small farms, typical of southern European countries, are generally not prepared to manage biomass energy generation systems. Biochar has multiple uses: domestic fuel, feed additive, as a filter element in water treatment plants (activated carbon); food additive, use in pharmaceuticals. In recent years, interest has been focused on agricultural use. The main agronomic advantages of spreading biochar in the field concern increasing soil fertility by improving its physical, chemical and biological properties, such as: Mechanical structure; Density and texture; Porosity and aeration; Water retention capacity; Increased pH in acidic soils; Cationic and anionic exchange capacity; Nutrient supply and decreased leaching of nutrients; Increased efficiency of the nitrogen cycle; Carbon supply of organic matrix, recalcitrant and ideal habitat for the development of microorganisms. Biochar is produced through a slow pyrolysis process from forestry waste and by-products, with an investment cost and operating complexity that ensure its sustainability under market conditions. The plant can also be operated by non-highly qualified personnel and allows biochar to be produced in a sustainable way, using local raw materials with limited polluting emissions.

Short title in native language

Il biochar rappresenta un valido aiuto contro i cambiamenti climatici, che

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

La produzione del biochar tramite pirolisi lenta rappresenta un'occasione per le aziende forestali per diversificare i loro introiti e per creare nuove e stabili opportunità di business rispetto alla tipica produzione decentralizzata di energia da biomassa. Le piccole aziende agricole, tipiche dei paesi dell'Europa del sud, non sono generalmente preparate alla gestione di sistemi di generazione di energia da biomassa. Il biochar ha molteplici usi: combustibile domestico, additivo per mangimi, come elemento filtrante negli impianti di trattamento acque (carboni attivi); additivo alimentare, utilizzo in farmaceutica. Negli ultimi anni si è concentarto l'interesse verso l'uso agricolo. I principali vantaggi agronomici dello spargimento di biochar in campo riguardano l'incremento della fertilità del suolo tramite il miglioramento delle sue proprietà fisiche, chimiche e biologiche, quali: struttura meccanica; densità e tessitura; Porosità ed areazione; Capacità di ritenzione idrica; Aumento del pH nei suoli acidi; Capacità di scambio cationica ed anionica; Apporto di nutrienti e diminuzione della lisciviazione degli stessi; Maggior efficienza del ciclo dell'azoto; Apporto di carbonio di matrice organica, recalcitrante e per l'Habitat ideale per lo sviluppo di microrganismi. - Delineare le indicazioni sull'attrezzatura necessaria, i costi di funzionamento e la fattibilità della soluzione nell'ambiente operativo valutato". Il biochar viene prodotto attraverso un processo di pirolisi lenta a partire da scarti e sottoprodotti della filiera forestale, con un costo di investimento e complessità di esercizio che garantiscono la sua sostenibilità sulle condizioni di mercato. L'impianto, inoltre, può essere operato anche da personale non altamente qualificato e permette di produrre biochar in modo sostenibile, usando materie prime locali limitate emissioni inquinanti.

Practice "abstract" 25:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English	pending
Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English* This summary should at least contain the following information: − Main **results/outcomes** of the activity (expected or final) − The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results? This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.	This PA is still waiting for the final approval and will be added thereafter.
Short title in native language	pending

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces). This summary should at least contain the following information: − Main **results/outcomes** of the activity (expected or final) − The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results? This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.	This PA is still waiting for the final approval and will be added thereafter.

Practice "abstract" 26:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Non-timber forest products (NTFPs) as possibilities for both forest owners and bioeconomy

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

In Finland, berries and mushrooms are commonly used non-timber forest products (NTFPs). There is a wide variety of other NTFPs that are used increasingly in the food sector, cosmetics, and health-promoting products. Still, NTFPs are a minor forest product in terms of their direct monetary value compared to timber, despite their potential use in products with high added value. Thus, boosting NTFPs value chains is needed in the Finnish rural bioeconomy.

The production of NTFPs not covered by everyman's right can create significant additional income for forest owners compared to timber production alone.

In large-scale sap tapping, where thousands of birches are tapped, requires investments in equipment and labor costs in installing and maintenance. Also considering the possible decrease in timber quality and value due to taphole wounds, sap tapping is profitable for forest owners. Despite its huge potential, there are only a few local companies buying sap collected by forest owners mainly as a family activity.

Specialty mushroom cultivation has recently been introduced to Finnish forestry. Living birch trees (Betula spp.) are inoculated with pakuri (Inonotus obliquus) by drilling holes in trunk and installing inoculation plugs in the holes. Cultivating pakuri in set-aside birch stands, there is no conflict with timber production. Specialty wood-decay mushrooms can be cultivated on stumps without any effect on timber production. For example, reishi (Ganoderma lucidum) could be cultivated in connection with harvesting operation like spreading the control agents in stump treatment against root rot. Both mushroom species are collected from forests naturally grown but the cultivation will increase the quantity supplied to the market.

Short title in native language

Metsien luonnontuotteet ovat mahdollisuus sekä metsänomistajille että

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
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Marjojen ja sienten lisäksi metsät tuottavat myös muita luonnontuotteita, joita käytetään raaka-aineena elintarvikkeissa, kosmetiikassa ja luontaistuotteissa. Kasvavasta raaka-ainekysynnästä ja korkean arvon lopputuotteista huolimatta luonnontuotteiden arvo on vain murto-osa puun myyntituloista. Metsäsektorin kaikkien toimijoiden – niin metsänomistajien kuin metsäalan ammattilaisten – tulisi nähdä luonnontuotteet aitona mahdollisuutena biotaloudessa. Luonnontuotealan haasteena on saada lisättyä metsien luomukeruualan määrää.

Luonnontuotteista, joita ei voi kerätä jokamiehenoikeuksin, saatavat lisätulot voivat olla merkittäviä metsänomistajille. Koivikoissamme virtaa keväisin suuret määrät mahlaa. Laajamittaisessa, jopa tuhansista koivuista tehtävässä mahlan valutuksessa käytetään putkiverkostoa. Välinekustannuksista ja valutusreikien mahdollisesti aiheuttamasta puuraaka-aineen laadun alentumasta huolimatta mahlan valutus on kannattavaa metsänomistajille. Tuotannon lisäämiseen on hyvät mahdollisuudet, mutta mahlayrityksiä on vain muutama ja ne ostavat mahlaa paikallisesti.

Ns. erikoissienten viljelyyn on kehitetty menetelmiä. Pakuria viljellään eläviin koivuihin, joiden runkoihin porattuihin reikiin työnnetään sienirihmastolla ympättyjä tappeja. Puuta lahottavien erikoissienten viljely onnistuu myös hakkuukannoilla. Esimerkiksi lakkakäävän viljely voidaan yhdistää kesäaikaiseen, koneelliseen hakkuuseen. Hakkuun yhteydessä lakkakäävän sienivalmistetta levitetään kannoille samalla tavalla kuin kantokäsittelyaine levitetään juurikäävän torjumiseksi. Pakurin ja viljeltyjen sienten poiminta ei kuulu jokamiehenoikeuksien piiriin.

Practice "abstract" 27:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Farm-scale energy and nutrients circulation through an on-farm micro biogas plant

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:
- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

A cattle farm located in Poland keeps dairy and meat cattle in a close circuit system, including the full production cycle from birth to dairy or meat production. On average, the farm rears 120 calves, 150 dairy cows and 130 meat cattle and the farm covers 430 ha of arable land. Cattle slurry is the only feedstock supplied to an on-farm biogas plant, which is technologically and functionally integrated with the dairy cows' shed. During the technological process, slurry is transported to a mesophilic digester. The biogas produced there (60% CH_4 and 40% CO_2), passing through an air lock, electric valve and carbon filter, feeds two electric engines, each with the power of 11 kW. The heat generated in the engine, water-cooled exhaust manifold and combustion gas heat exchanger are used to heat the digester and produce hot water for the internal on-farm use. Digestate is collected in a tank and used for fertilization of the farm's fields.
The on-farm micro biogas plant with the range of electric power from 10-50 kWe has several benefits. The solution promotes prosumerism where the energy consumer also produces energy increasing energy self-sufficiency and mitigating the need to purchase energy. The solution also promotes ecofriendly activities related to on-farm utilization of generated waste. The micro biogas plant is also an integral part of agricultural production (livestock in this case) securing internal circulation of nutrients in the farm and mitigating emission effect.

Short title in native language

Mikrobiogazownia w systemie produkcji rolniczej

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Farma bydła zlokalizowana w Polsce utrzymuje bydło mleczne i mięsne w systemie zamkniętym, obejmującym pełny cykl produkcyjny od rozrodu do produkcji mlecznej i mięsnej. Średniorocznie, w gospodarstwie prowadzi się odchów 120 sztuk cieląt, 150 sztuk krów mlecznych i 130 sztuk bydła opasowego. a gospodarstwo dysponuje areałem gruntów ornych o powierzchni 430 ha.
Gnojowica bydlęca jest jedynym substratem biogazowni zintegrowanej technologicznie i funkcjonalnie z obiektem obory krów mlecznych. W procesie technologicznym gnojowica jest transportowana do reaktora fermentacji mezofilowej. Wytworzony biogaz (60% CH_4 i 40% CO_2) poprzez śluzę powietrzną, elektrozawór i filtr węglowy zasila dwa silniki elektryczne o mocy 11 kW każdy. Energia cieplna wywarzana w silniku, kolektorze wydechowym chłodzonym wodą i wymienniku ciepła gazów spalinowych jest wykorzystywana do ogrzewania reaktora i produkcji ciepłej wody. Poferment jest gromadzony w zbiorniku i wykorzystywany do nawożenia własnych gruntów.
Zakładowa mikrobiogazownia o zakresie mocy elektrycznej od 10-50 kWe ma kilka zalet. Rozwiązanie promuje prosumeryzm, w którym odbiorca energii również wytwarza energię zwiększając samowystarczalność energetyczną i zmniejszając potrzebę zakupu energii. Rozwiązanie promuje również proekologiczne działania związane z utylizacją w gospodarstwach wytworzonych odpadów. Mikrobiogazownia jest również integralną częścią produkcji rolniczej (w tym przypadku hodowlanej) zabezpieczając wewnętrzny obieg składników pokarmowych w gospodarstwie i ograniczając efekt emisyjny.

Practice "abstract" 28:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Cleaning system for olive stones

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Sectorial stakeholders have shown an increasing interest, leading Secaderos de la Loma to develop a modular cleaning system for olive stones for different power ratings which allow to obtain a better quality (reduce the amount of dust and peels) and dryer biofuel by means of the cleaning of the olive stone. In turn, the increased quality of the biofuel will contribute to achieve a better boiler performance and reduce the maintenance required. This equipment can operate with dry material but also with olive stones with a moisture content up to 20 % in automatic mode. It is also able to work with different input flow rates, achieving a production that can fluctuate from 2 tonnes per hour up to 14 tonnes per hour of dry product reaching almost 100 % efficiency even when the input flow is maximum. The investment payback time can be reached in around 3 years and requires an investment of 45,000 euros. The equipment is already operating in 3 companies located in the south of Spain.

The installation of this equipment as part of the production line implies diverse benefits such as the possibility to certify the olive stones production according to the BIOMASUD certification scheme, it contributes to the local circular economy of the company increasing the waste valorisation and raise awareness in the municipality in this regard, helping to reduce the employment seasonality during the olive campaign and allowing the valorisation of one of the subproducts obtained during the processing with the resulting economic benefit.

Short title in native language

Limpiadora de hueso de aceituna

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

El creciente interés por parte de los agentes del sector ha llevado a la empresa Secaderos de la Loma a desarrollar este tipo de limpiadoras modulares para distintas potencias que permiten la limpieza de hueso y por ende la obtención de un biocombustible de mayor calidad sin humedad, polvo o pellejo, lo que repercute sobre la operación y mantenimiento de los equipos de combustión en los que se valoriza. El equipo permite la limpieza del hueso de aceituna tanto seco como con una humedad de hasta el 20% de forma automática y es capaz de operar con flujos de entrada muy dispares, por lo que la producción puede variar entre 2 y 14 toneladas/hora de producto seco rozando una eficienncia del 100 %, incluso cuando la entrada del hueso es masiva. Desde el punto de vista de la amortización, el equipo se amortiza en un periodo de alrededor de 3 años y require una inversión de 45.000 euros. Se han instalado 3 equipos en empresas ubicadas en el sur de España. La implantación de este equipo como parte del proceso productivo tiene asociado numerosos beneficios como son el certificar la producción de hueso bajo el certificado BIOMASUD, contribuir a generar una economía
circular en la empresa a través de la valorización del sub-producto y generar una concienciación en torno a este tema en la localidad, ayudando a reducir la temporalidad de los contratos de la campaña de la aceituna y permitiendo valorizar uno de los subproductos del proceso, con el consiguiente beneficio económico.

Practice "abstract" 29:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Self-cleaning rotary boiler for solid waste

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Boiler fouling and corrosion are two of the most challenging draw-backs when operating a boiler with solid biofuels such as the olive cake or poultry manure presenting a high LHV which makes them quite attractive to valorise them with energy purposes. However, the high content of unburned and chemical components leads to the generation of deposits on the heat exchangers. The consequences associated to these phenomena include the decrease of the boiler performance, clogging and corrosion occurrence. Traditional cleaning system operating in continuous mode do not guarantee a stable performance during operation neither the avoidance of deposits formation in the heat exchanger surfaces which implies the need to schedule regular shutdowns for maintenance. This new boiler concept developed and patented by SUGIMAT, is based on a rotatory boiler and an automatic cleaning system that avoid clogging and keeps the system clean. This boiler can be developed for power ranges up to 12 MW and it can adapt to different combustion systems. One of the main advantages derives from its capacity to operate with materials that contain a high percentage of ash and dust without affecting its performance due to clogging phenomenons and savings associated to the compressor for blower cleaning. It is also worth highlighting its installation versatility since the heater allows different locations with respect to the combustion chamber.

Short title in native language

Caldera rotativa autolimpiable para re-siduos sólidos

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

El ensuciamiento y la corrosión en caldera son dos de los principales problemas a la hora de valorizar biocombustibles sólidos como el orujillo o la gallinaza. Tienen un alto poder calorífico, lo que los hace atractivos, pero contienen altas tasas de inquemables y compuestos químicos que provocan
depósitos sobre los intercambiadores de calor. Esto conlleva un menor rendimiento de los
equipos, la obstrucción de pasos de humos y corrosión. Los sistemas de limpieza en continuo tradicionales no
garantizan un rendimiento estable del equipo durante el tiempo de operación, ni evitan la formación de
depósitos en los cuerpos de intercambio, forzando paradas para la limpieza.
Este nuevo concepto de caldera desarrollado y patentado por SUGIMAT, se basa en una caldera rotativa con sistema de autolimpieza que combate de forma eficaz el ensuciamiento y la formación de depósitos en su interior. La caldera se fabrica en rangos de hasta 12 MW de potencia y puede adaptarse a distintos sistemas de combustión. Las principales ventajas de esta caldera incluyen su capacidad de operar de forma eficiente con combustibles con altísimos porcentajes de inquemables sin problemas de obstrucción de paso ni disminución de rendimiento, el ahorro del consumo eléctrico que precisa la limpieza por aire comprimido, consigue un rendimiento estable durante el tiempo de operación, evita tener que realizar paradas programadas para limpieza, su versatilidad de montaje y la eficiencia global de la instalación.

Practice "abstract" 30:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Pallet valorisation system for energy purposes

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Many companies heed a lot of hot water (in the food industry for cleaning for example) and at the same time have a lot of one use pallets, which they normally have to dispose. The idea of this system is to use the pallets to heat up the water which is needed. It consists of a Heizomat pallet chipper, a wood chips deposit and a Heizomat woodchips boiler, all monted inside a 40" container. The system contributes to reducing the company's energy costs (the recovery of 13 pallets replaces 100 litres of diesel), significantly reducing the space required for pallet storage and eliminating the transport costs associated with moving the pallets to the disposal or treatment site, which also leads to a reduction in greenhouse gas emissions associated with this transport, thereby contributing both to reducing climate change and to the circular economy.
This is a 100 kW system that can produce around 250,000 kWh of heat per year (equivalent to 25,000 litres of diesel with an associated cost of around €20,000/year depending on the cost of diesel, which is on an upward trend). Considering a conservative scenario, it is estimated that the system would pay for itself in approximately 5 years (for the 200 kW boiler the payback period is considerably shorter). In addition, there are further savings associated with the avoided payment for the collection of the pallets or the sale of certificates for the avoided CO2 emissions.

Short title in native language

Contenedor para la valorización de palets para calor

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

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Numerosas empresas por un lado emplean palets de un solo uso y por otro necesitan calor en su proceso productivo. Con el objetivo de posibilitar aprovechar esa casuística Heizomat ha desarrollado un sistema que permite valorizar la energía de los palets, produciendo calor. El sistema consiste en una astilladora de palets, un silo para almacenamiento de las astillas y una caldera para su combustión, todo integrado en un contenedor.

El sistema contribuye a reducir el coste energético de la empresa (la valorización de 13 palets permite sustituir 100 litros de gasoil), reducir significativamente el espacio necesario para el almacenamiento de palets y eliminar los costes de transporte asociados al traslado de los palets al lugar de vertido o tratamiento lo que conlleva además una reducción de la emisión de gases de efecto invernadoro asociada a este transporte contribuyendo con ello tanto a la reducción del cambio climático como a la economía circular.

Se trata de un sistema de 100 kW que puede producir alrededor de 250.000 kWh de calor al año (equivalente a 25.000 litros de gasoil con un coste asociado alrededor de 20.000€/año en función del coste del gasoil que presenta una tendencia creciente). Considerando un escenario conservador, se estima que el sistema estaría amortizado en aproximadamente 5 años (para la caldera de 200 kW el periodo de amortización es considerablemente más corto). Además, se incurren en otros ahorros asociados al pago que se evita por la recogida de los palets o la venta de certificados por las emisiones de CO_2 evitadas.

Practice "abstract" 31:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Climate-smart food production

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The Qvidja organic farm is a pilot farm that follows the innovative principle, taking into account both nutrient recycling and carbon sequestration. The aim of the farm is to mitigate climate change and to increase biodiversity. In addition, emissions to Baltic Sea are minimized. Cows, horses and sheep graze on the farm. All the fields (180 hectares) are on grassland, which aims to improve the structure of the land. The farm is gradually switching into a crop rotation with the emphasis on native species and nitrogen-binding plants. In addition to food production, the farm has a biogas plant, a biomethane filling station and a wood gasification plant. In the gasification unit, the gas is utilized in electricity and heat production. The farm also has a wood chip heating plant, and a solar power plant. Grass and manure from the farm are used as a feed for the biogas plant. The produced biogas is upgraded, after which biomethane can be used as a vehicle fuel. There are three methane-powered vehicles on the farm. Instead of releasing carbon dioxide from biogas to the atmosphere, in Qvidja the carbon dioxide is fed to QPower's biological methanation pilot plant, which utilizes microbes to produce methane from carbon dioxide and hydrogen. Hydrogen for the pilot plant is obtained from electrolysis and from the wood gasification unit. Plant's efficiency is 82%, which doubles the methane production. Digestate from biogas plant is used as fertilizer on the farm. By improving the soil structure and using recycled fertilizers according to plant needs, nutrient leaching can be minimized and carbon sequestration in the fields can be increased. All work is done for the climate and the Baltic Sea, biodiversity being the foundation for all actions.

Short title in native language

Ilmastoviisasta ruoantuotantoa

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

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Qvidjan luomutila on uudistavaa periaatetta noudattava kokeilutila, jossa huomioidaan niin ravinteiden kierrätys kuin hiilensidonta. Tavoitteena on ilmastonmuutoksen hillintä ja luonnon monimuotoisuuden kasvaminen. Lisäksi päästöt Itämereen minimoidaan. Tilalla laiduntaa nautoja, hevosia ja lampaita. Pelloilla pyritään maaperän hiilivarastoa kartuttavaan, biologiseen viljelyyn. Kaikki pellot (180 ha) ovat nurmella, jolla tavoitellaan maan rakenteen parantamista. Vähitellen tilalla siirrytään viljelykiertoon, jossa korostetaan kotoperäisiä lajeja ja typensitojakasveja. Ruoantuotannon lisäksi tilalla on biokaasulaitos ja puukaasulaitos, jonka kaasu hyödynnetään sähkön ja lämmöntuotannossa, hakelämpölaitos sekä aurinkovoimalaitos. Biokaasulaitoksessa hyödynnetään nurmia ja lantoja. Tuotettu biokaasu puhdistetaan, jonka jälkeen biometaania voidaan käyttää ajoneuvojen polttoaineena. Tilalla on kolme metaanikäyttöistä ajoneuvoa.Biokaasu tuottaa aina noin 40 % hiilidioksidia. Sen sijaan että se päästettäisiin ilmaan, Qvidjassa se syötetään QPowerin biologisen metanoinnin reaktoriin, joka tekee vedystä ja hiilidioksidista metaania mikrobien avulla. Vetyä saadaan elektolyysilaitteistolla sekä puukaasulaitoksesta. Metanointilaitos toimii 82 % hyötysuhteella. Biokaasulaitoksen mädäte hyödynnetään tilalla lannoitteena. Maaperän rakennetta parantamalla ja käyttämällä kierrätyslannoitteita kasvien tarpeen mukaisesti, pyritään vähentämään ravinteiden huuhtoutumista ja lisäämään hiilen sidontaa pelloilla. Kaikki tilan toiminta perustuu Itämeri-ystävälliselle ja ravinteita kierrättävälle ruoantuotannolle, ja biodiversiteetti on kaiken perustana.

Practice "abstract" 32:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

New value chains from milk

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

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This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The company Qmilch use a new technology producing synthetic fibers, microbeads, biopolymers, and thousands of other materials that are biodegradable made of the milk protein called casein. The casein, which is the main resource of the products is produced from raw milk that isn't tradable and in accordance to legal regulations not be used as food. Although the milk is not suitable for consumption, the milk still contains valuable ingredients like casein, that offers a big potential for technical purposes. Furthermore, it is a raw material, which is inevitably accrued and thus only extend its product life cycle is used.
With over 3000 recipes, the company offers a wide range of modifications of thermoplastic elastomeric, but also properties of thermosets for different purposes. By customizable cross linking the material leads to a good mechanical strength and chemical resistance for various technical areas of interest.
Because of the eco-efficient production technology and special recipe, new standards in fibre production were set, implying cost-reduction, minimum of waste and maximizes renewal. For example, for the production of 1 kg of fibre only 5 minutes and max. 2 liters of water are needed. This implies a particular level of cost efficiency and ensures a minimum of CO_2 emissions. Qmilch fibre is biodegradable, without chemical additives and naturally antibacterial. For its characteristics, it brings a lot of advantages for end-users. The new value chains can support dairy farmers of using the residues of raw milk an turning waste milk into a resource.
The company has the potential to be a sustainable replacement for petroleum based synthetic fibers, and certain types of plastic food packaging as well as numerous other applications that have yet to be

Short title in native language

Neue Wertschöpfungsketten aus Milch

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

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- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Das Unternehmen Qmilch verwendet eine neuartige Technologie zur Herstellung von synthetischen Fasern, Mikroperlen, Biopolymeren und anderen biologisch abbaubaren Materialien, die aus dem Milchprotein Kasein erzeugt werden. Das Kasein wird aus Rohmilch gewonnen, die nicht im Handel erhältlich ist und nach den gesetzlichen Bestimmungen nicht als Lebensmittel verwendet werden darf. Die Milch ist zwar nicht zum Verzehr geeignet, enthält aber dennoch wertvolle Inhaltsstoffe wie Kasein, die ein großes Potenzial für technische Zwecke bieten. Außerdem handelt es sich um einen Rohstoff, der unweigerlich in der Milchproduktion anfällt und somit nur zur Verlängerung des Produktlebenszyklus verwendet wird.
Mit über 3000 Rezepturen bietet das Unternehmen eine breite Palette an Abwandlungen von thermoplastische Elastomeren, aber auch Eigenschaften von Duroplasten für unterschiedliche Einsatzzwecke als Kunststoffe. Durch anpassungsfähige Vernetzungen führt das Material zu einer sehr guten mechanischen Festigkeit und chemischen Beständigkeit für verschiedenste technische Anwendungsbereiche.
Im Bereich der Faserproduktion wird eine umweltschonende Produktionstechnologie eingesetzt, die zu Kostensenkungen und einer Minimierung des Abfalls führt. Zum Beispiel werden für die Herstellung von 1 kg Fasern nur 5 Minuten und max. 2 Liter Wasser benötigt. Dies bedeutet ein besonderes Maß an Kosteneffizienz und gewährleistet ein Minimum an CO2-Emissionen. Die Qmilch-Faser ist biologisch abbaubar, ohne chemische Zusätze und von Natur aus antibakteriell. Aufgrund ihrer Eigenschaften bringt sie viele Vorteile für die Endverbraucher. Die neuen Wertschöpfungsketten können die Milchbauern dabei unterstützen, die Reste der Rohmilch zu verwerten und die Milchabfälle in eine Ressource zu verwandeln.
Das Unternehmen bietet Potenzial, synthetische Fasern auf Erdölbasis und bestimmte Arten von Lebensmittelverpackungen aus Kunststoff nachhaltig zu ersetzen, sowie zahlreiche andere Anwendungen, die noch nicht vollständig erforscht sind.

Practice "abstract" 33:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Increasing energy independency in a rural municipality: case Barciany

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

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- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

A rural Polish municipality Barciany has a relatively low population density rate and is dominated by farmland (83% of all land). Practically, all the municipality's area is covered by the Natura 2000 environmental protection programme, which limits the possibility of constructing large wind and photovoltaic farms.
The municipality has been steadily developing its energy independence based on renewable energy resources in a system consisting of energy producers and consumers (prosumers). In 2009, two municipal biomass-fed district heating plants with the capacity of 1.3 MW and 0.3 MW were created through the natural conversion of fossil fuel powered municipal boiler plants used until then. The heating plants are fueled with wooden chips from trimming roadside shrubs and from other sources of waste lignocellulosic biomass such as forest and garden residues. The boilers operate during the heating season and supply heat to households and public buildings in the municipality. In 2013, a total of five geothermal heat pumps powered by electricity from the grid were installed to two municipal schools reducing the total heating costs by 70%. In 2017, a small photovoltaic farm with a capacity of 29 kW was installed on the premises of the Municipal Office and the municipality's office. Also, a workshop building was fitted with a geothermal heat pump and a photovoltaic installation with the capacity of 8.5 kW. The generated electricity is sold to an electricity distributor and the profits added to the municipality's revenues. The future goal of the municipality is to further develop the municipal district heating system to other households and public buildings that currently use coal as heating fuel.

Short title in native language

Barciany: Gminny system prosumenta energetycznego

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Polska gmina wiejska Barciany ma niski wskaźnik gęstości zaludnienia a w strukturze gruntów dominują użytki rolne (83% wszystkich gruntów). Praktycznie cały obszar gminy objęty jest programem ochrony przyrody Natura 2000 limitując możliwość budowy dużych farm wiatrowych i fotowoltaicznych. Gmina rozwija niezależność energetyczną w oparciu o OZE w systemie składającym się z producentów energii i konsumentów (prosumentów). W 2009 roku powstały 2 ciepłownie miejskie o mocy 1,3 MW i 0,3 MW zasilane biomasą w efekcie przekształcenia dotychczas użytkowanych kotłowni na paliwa kopalne. Ciepłownie zasilane są zrębkami drzewnymi z przycinania przydrożnych krzewów oraz innych źródeł odpadowej biomasy lignocelulozowej. Kotły w sezonie grzewczym dostarczają ciepło do gospodarstw domowych i budynków użyteczności publicznej na terenie gminy. W 2013 roku w 2 szkołach miejskich zainstalowano łącznie 5 geotermalnych pomp ciepła zasilanych energią elektryczną z sieci, co obniżyło koszty ogrzewania o 70%. W 2017 roku na terenie Urzędu Gminy zainstalowano małą farmę fotowoltaiczną o mocy 29 kW. Dodatkowo budynek warsztatowy został wyposażony w geotermalną pompę ciepła oraz instalację fotowoltaiczną o mocy 8,5 kW. Wytworzona energia elektryczna jest sprzedawana dystrybutorowi energii, a zyski zasilają budżet gminy. Rozwój miejskiego systemu ciepłowniczego zakłada jego rozszerzenie o inne gospodarstwa domowe i budynki użyteczności publicznej, które obecnie wykorzystują węgiel jako paliwo grzewcze.

Practice "abstract" 34:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

From cereal straw to district heat: case Kisielice

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The district heating system in the municipality of Kisielice was the starting element in building the municipality's energy independence based on renewable energy sources. Low-efficiency and high-emission local boilers were started to be replaced in 2004, when two biomass boilers, with the capacity of 1 and 2 MW, were installed. Next, by 2007, the heating plant had been expanded by installing another boiler, with the capacity of 3 MW, and a 100 kW photovoltaic power plant.
The source of biomass is cereal straw. The heating plant, having 40-60 contract agreements with local farmers, gathers straw directly after cereal harvest. The cost of buying straw from a farmer is €11/t. The total cost incurred to the heat plant, covering the purchase, transport, preparation of straw for storage, is €21/t. The heating plant can easily acquire sufficient quantities of straw. At the average efficiency of the broilers, reaching 90%, the annual average consumption of straw is 3 500 tons. The ash obtained in the process is collected by local farmers for free and applied as a fertilizer on their fields. The potential use of ash suitable for being managed is even greater than today.
Transforming low-cost straw into high-value heating energy is a locally generated added value. First, straw is cheaper than fossil fuels and biomass from dedicated production. Second, straw is a by-product that does not need an advanced processing. Third, the low-cost heating is based on local resources and contributes to the farmer's profitability and overall well-being of local and general society by reducing household's energy costs. And last, a part of straw yield harvested by the municipal company for energy purposes is partly compensated by returning minerals (ash) to the arable land.

Short title in native language

Hybrydowy system zasilania energią odnawialną lokalnej sieci

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

System ciepłowniczy w gminie Kisielice był elementem wyjściowym budowania niezależności energetycznej gminy w oparciu o odnawialne źródła energii. Wymianę niskosprawnych i wysokoemisyjnych kotłowni lokalnych rozpoczęto w 2004 r. budując pierwsze dwa kotły na biomasę o mocach 1 i 2 MW a następnie od 2007 r. rozbudowę ciepłowni o kolejny kocioł o mocy 3 MW i elektrownię fotowoltaiczną o mocy 100 kW. Źródłem biomasy jest słoma zbożowa. Ciepłownia, w ramach 40-60 umów kontraktowych z lokalnymi rolnikami, zbiera słomę bezpośrednio z pokosów. Koszt zakupu słomy od rolnika to 11 €/t. Całkowity koszt poniesiony na ciepłownię, obejmujący zakup, transport, przygotowanie słomy do przechowywania to 21 €/t. Ciepłownia może z łatwością pozyskać wystarczającą ilość słomy. Przy średniej wydajności kotłów, sięgającej 90%, średnie roczne zużycie słomy wynosi 3500 ton. Powstały popiół jest w całości odbierany przez okolicznych rolników za darmo i aplikowany na polach. Potencjał możliwego do zagospodarowania popiołu jest nawet większy niż obecnie. Przekształcenie taniej słomy w wysokowartościową energię cieplną jest lokalnie generowaną wartością dodaną. Po pierwsze, słoma jest tańsza niż paliwa kopalne i biomasa z dedykowanej produkcji. Po drugie, słoma jest produktem ubocznym, który nie wymaga zaawansowanego przetwarzania. Po trzecie, tanie ogrzewanie opiera się na lokalnych zasobach i przyczynia się do wzrostu dochorów rolnika oraz ogólnego dobrobytu lokalnego i społeczeństwa lokalnego poprzez zmniejszenie kosztów energii w gospodarstwach domowych. Dodatkowo, część plonu słomy zebranej przez komunalne przedsiębiorstwo na cele energetyczne jest rekompensowana przez zwrot minerałów (popiołu) na grunty orne.

Practice "abstract" 35:

Several practice abstracts may be needed for one project, depending on the size of the project and the number of outcomes/recommendations which are ready for practice.

Short title in English

Added value from an agricultural biogas plant

Short summary for practitioners in english on the (final or expected) outcomes (1000-1500 characters, word count – no spaces). *Do not complete if the summary below is completed in English*

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The biogas plant BIO-NIK ELEKTRA Sp. z o.o. in Kisielice, with the capacity of 0.999 MWe and 1.1 MWth, launched in 2014, is an integral part of an agricultural farm (1,800 ha).
The feedstock used in this biogas plant is maize silage in an amount of 17.5 thousand tons and slurry in an amount of 7,000 m3 obtained from own arable land and piggery. The biogas plant is a classical installation with sections of harvest, ensiling and storage of maize silage, and the transport of slurry, a fermentation digester and secondary digester, digestate tank, and a cogeneration system with the capacity of 1.2 MW. The average annual production of biogas is 4,300 million m3, including 8,400 MWh of electricity and 29,733 GJ of heat. The biogas plant has a potential for further improvement of energy efficiency.
The biogas plant, while generating revenue from electric power sold to an electrical grid, is also a part of the organic matter circulation. In addition, some of the heat generated at the plant is used internally on the farm while part of it is sold to the municipal district heating system. Therefore, the biogas plant has a positive impact on the local community as well.
The added value of the biogas plant operating on the farm has an economic dimension, i.e., the price for sold kilowatt of electric power, own costs of operating the biogas plant plus price for blue certificates, an environmental dimension i.e., digestate mass supplied to the farm's fields and a social dimension, i.e., quantity and price of heat power sold to the district heating system in Kisielice municipality.

Short title in native language

Biogazownia jako element łańcucha wartości w zrównoważonej

Short summary for practitioners in native language (*can be the language of the coordinator / one of the partners - otherwise in English*) (1000-1500 characters, word count – no spaces).

This summary should at least contain the following information:

- Main **results/outcomes** of the activity (expected or final)
- The **main practical recommendation(s)**: what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

Biogazownia rolnicza BIO-NIK ELEKTRA Sp. z o.o. w Kisielicach o mocy 0.999 MW i 1.1 MW uruchomiona w 2014 r. jest integralną częścią działalności gospodarstwa rolniczego (1800 ha).
Substrat biogazowni jest kiszonka kukurydzy (17,5 tys. ton) oraz gnojowica (7000 m3) pozyskiwane z własnych gruntów ornych i fermy trzody chlewnej. Biogazownia jest klasyczną instalacją z sekcjami zbioru, kiszenia i magazynowania kiszonki kukurydzy oraz transportu gnojowicy, komory fermentacji i wtórnej komory fermentacji, zbiornika na poferment oraz układu kogeneracyjnego (moc 1.2 MW). Średnioroczna produkcja biogazu wynosi 4.300 mln m3 (energii elektrycznej 8400 MWh i cieplnej 29.733 GJ). Biogazownia ma potencjał poprawy efektywności energetycznej.
Zgodnie z dobrą praktyką rolniczą poferment biogazowni wykorzystuje się do nawożenia własnych gruntów. Według aktualnych analiz glebowych systematyczne wzbogacanie gleby w materię organiczną pofermentu korzystnie wpływa na koncentrację C org. w glebie na poziomie 2.2%, co wskazuje na istotnie większą zawartość materii organicznej w glebie w porównaniu z wartościami 1-2% dla 56% gruntów ornych w Polsce. Biogazownia, generując przychody z energii elektrycznej, stanowi jednocześnie finalny etap cyrkulacji materii organicznej i części energii cieplnej w obrębie gospodarstwa i pozytywnie oddziałuje na lokalną społeczność będąc elementem gminnego systemu ciepłowniczego. Wartość dodana biogazowni w gospodarstwie ma wymiar ekonomiczny (cena za sprzedany kW energii elektrycznej, koszty własne funkcjonowania, cena za błękitne certyfikaty), środowiskowy (poferment, który trafia na pola gospodarstwa) oraz społeczny (ilość i cena energii cieplnej sprzedawanej do sieci).