# NOBEL - Novel business models and mechanisms for the sustainable supply of and payment for forest ecosystem services

ForestValue Research Programme
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ERA-NET Cofund – Innovating the forest-based bioeconomy

Project NOBEL is supported under the umbrella of ERA-NET Cofund ForestValue by BMLFUW (AT), ANR (FR), FNR (DE), Vinnova (SE), MINECO-AEI (ES), RCN (NO) and FCT (PT).

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NOBEL

# Background and motivation for NOBEL

- demand for timber, non-timber products and ecosystem services is increasing due to growing populations and socio-economic changes
- many important services have no direct monetary value
- various mechanism for payments for ecosystem services are known
- forest management often favour timber production over other services
- changing environmental and socio-economic conditions cause uncertainties
- need for policy recommendation and economic incentives



protection recreation biomass timber services biodiversity

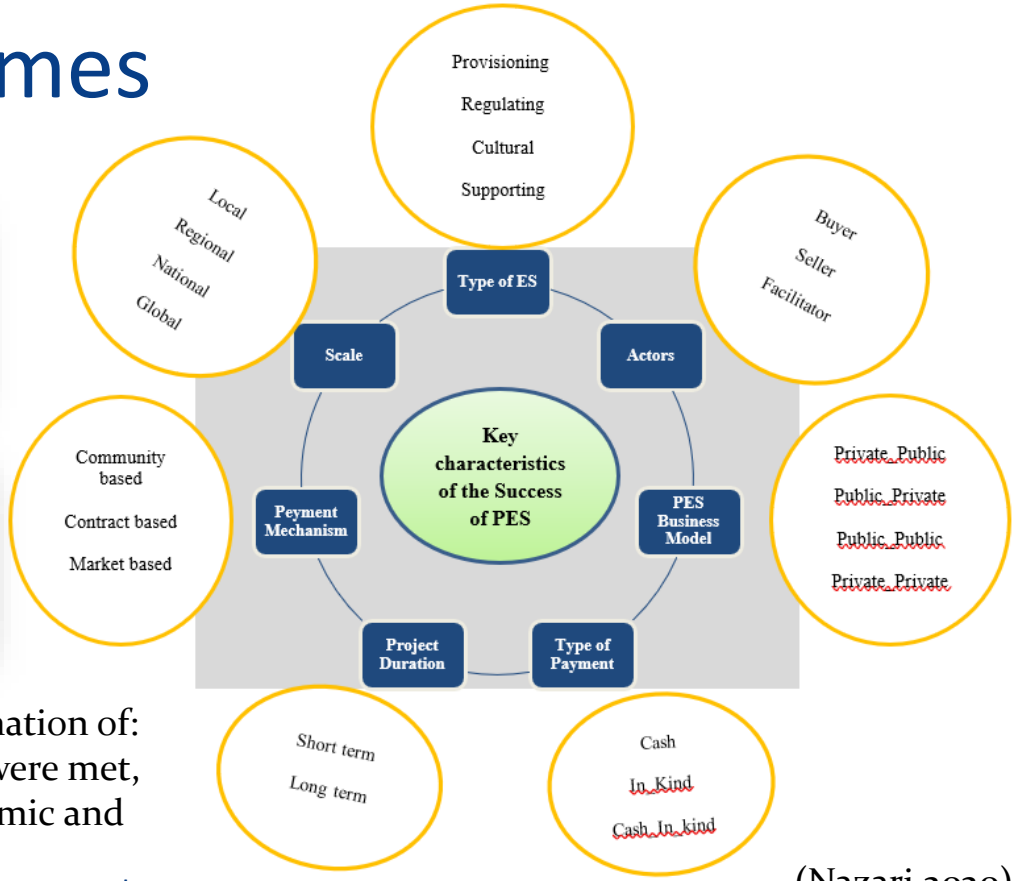





# Project objectives of NOBEL

- Design **innovative methodologies** for assessing the economic, social and environmental **values of forest products and services** at regional and national scale
- **develop business models, mechanisms** and **novel public policies** to internalise the socio-economic value of non-market forest ecosystem services
- combine business models with public policy instruments for **implementing PES** and deduct trade-offs in pilot demonstrations
- demonstrate and **compare alternative PES schemes**, including an innovative **web-based auction platform**

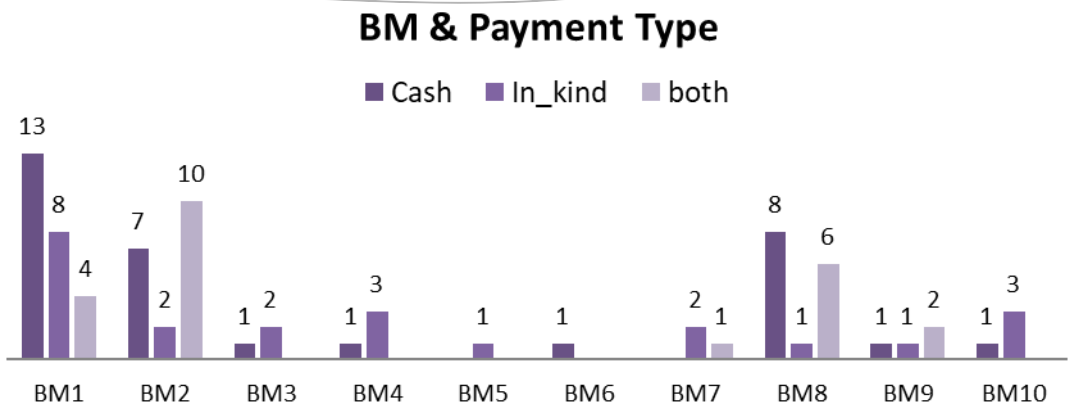
# Analysis of PES schemes

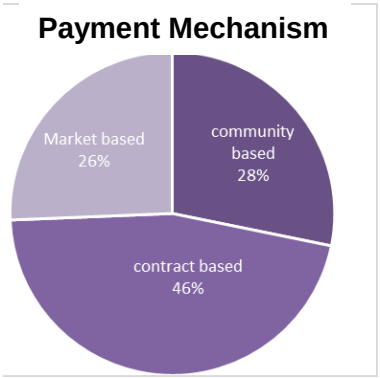


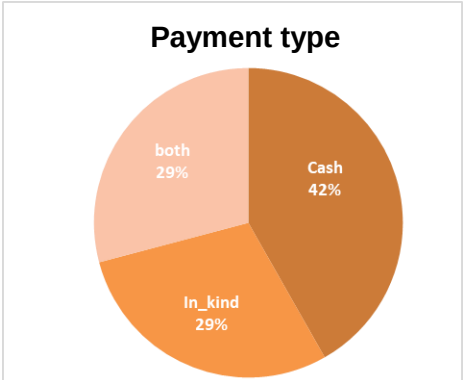

success was defined for 85 case studies as combination of:
(a) extent to which the goals of the PES scheme were met,
(b) overall improvement of the ecological, economic and social conditions of the region

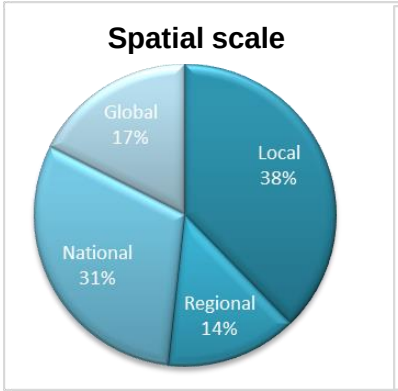
(Nazari 2020)

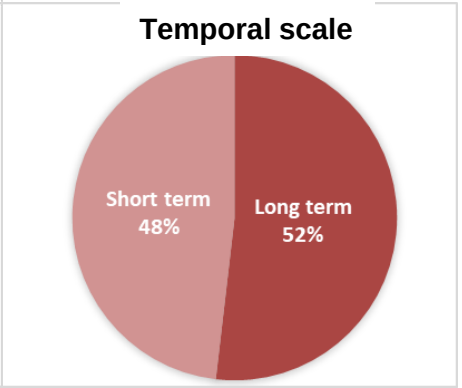
# Characterisation of PES schemes



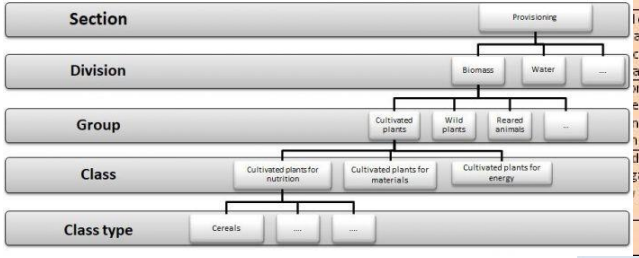




(Nazari 2020)

# Development of a set of ES indicators

| Section | Division | Group | Class | Indicators |
|---|---|---|---|---|
| Provisioning (Biotic) | Biomass | Wild plants (terrestrial and aquatic) for nutrition, materials or energy | Wild plants (terrestrial and aquatic, including fungi, algae) used for nutrition | Production of wild berries and fruits<br>Production of mushrooms |
| | | | Fibres and other materials from wild plants for direct use or processing (excluding genetic materials) | Timber volume harvested<br>Timber volume harvested by species and/or diameter class<br>Productivity<br>Stocking<br>Timber yield by assortment<br>Production of cork |
| | | | Wild plants (terrestrial and aquatic, including fungi, algae) used as a source of energy | Above and below ground wood energy biomass<br>Wood energy biomass (technically harvestable) |
| | | Wild animals (terrestrial and aquatic) for nutrition | Wild animals (terrestrial and aquatic) used for nutritional | Population sizes of species of interest |
| | | | other materials animals for direct cessing (excluding aterials) | Population sizes of species of interest |
| | | | res and other erials collected for ng or establishing a | Potential for the production of forest reproductive material |
| | | | lower plants ganisms) used to strains or | Potential for the production of forest reproductive material |
| | | | | Net Ecosystem Productivity (NEP) |




| | | | | |
|---|---|---|---|---|
| Regulation & Maintenance (Biotic) | Transformation of biochemical or physical inputs to ecosystems | Mediation of wastes or toxic substances of anthropogenic origin by living processes | Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals | Area occupied by riparian forests |
| | | Mediation of nuisances of anthropogenic origin | Smell reduction | Tree cover density around infrastructure |
| | | | Noise attenuation | Distance to infrastructure |
| | | | Visual screening | Distance to infrastructure |
| | Regulation of physical, chemical, biological conditions | Regulation of baseline flows and extreme events | Control of erosion rates | Soil erosion risk or erosion protection |
| | | | Buffering and attenuation of mass movement | Protection against rock-fall<br>Protection against avalanches<br>Protection against landslide and erosion |
| | | | Hydrological cycle and water flow regulation (Including flood control, and coastal protection) | Area of wetlands located in flood risk zones |
| | | | Wind protection | Distance to infrastructure in relation to tree height |
| | | | Fire protection | Tree species diversity (coniferous vs. deciduous)<br>Wildfire risk regulation |
| | | | Pollination (or 'gamete' dispersal in a marine context) | Red List Index for pollinating species |
| | | | Maintaining nursery populations and habitats (including gene pool protection) | Tree species diversity<br>Tree size diversity<br>Dead wood abundance<br>Abundance of large standing dead trees<br>Abundance of large living trees<br>Plant biodiversity |
| | | | Pest control (including invasive species) | Forest diversity and cover |
| | | | Disease control | Forest diversity and cover |
| | | | Weathering processes and their effect on soil quality | Soil organic matter content<br>pH topsoil |
| | | | Decomposition and fixing processes and their effect on soil quality | Area of nitrogen-fixing vegetation |
| | | | Regulation of the chemical condition of freshwaters by living processes | Area occupied by riparian forests<br>Area of wetlands located in flood risk zones |
| | | | Regulation of chemical composition of atmosphere and oceans | Above ground carbon<br>Below ground carbon<br>Dead wood carbon (standing and coarse woody debris)<br>Soil carbon<br>Avoided CO2 release due to fire mitigation |
| | | | Regulation of temperature and humidity, including ventilation and transpiration | Evapotranspiration |
| Provisioning (Abiotic) | Water | Surface water used for nutrition, materials or energy | Surface water for drinking | Volume of water extracted |
| | | | Surface water used as a material (non-drinking purposes) | Volume of water extracted |
| | | | Freshwater surface water used as an energy source | Energy produced from hydropower plants |
| | | Ground water for used for | Ground (and subsurface) water for drinking | Volume of water extracted |
| | | | Ground water (and subsurface) used as a material (non-drinking purposes) | Volume of water extracted |
| | | | Mineral substances used for nutritional purposes | Salt extracted |
| | | | Wind energy | Mean annual wind speed |
| | | | Solar energy | Solar irradiation |
| | | | Mediation by other chemical or physical means (e.g. via filtration, sequestration, storage or accumulation) | Soil structure and composition |
| | | | Mediation of nuisances by abiotic structures or processes | Terrain Ruggedness Index |
| | | | Mass flows | Floodplain areas |
| | | | Liquid flows | Floodplain areas |
| | | | Natural, abiotic characteristics of nature that enable active or passive physical and experiential interactions | Density of footpaths |
| | | | Natural, abiotic characteristics of nature that enable intellectual interactions | Number of academic and non-academic publications referring to the abiotic characteristics of nature |
| | | | Natural, abiotic characteristics of nature that enable spiritual, symbolic and other interactions | Public awareness |
| | | | Natural, abiotic characteristics or features of nature that have either an existence, option or bequest value | Willingness to pay (WTP) |
| | | d experiential s with natural nt | Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through active or immersive interactions | Visitor statistics<br>Recreational and Aesthetic Value of Forested Landscapes |
| | | | Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions | Visitor statistics |
| | | l and tive interactions l environment | Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge | Number of academic and non-academic publications referring to the living systems |
| | | | Characteristics of living systems that enable education and training | Citizen science |
| | | | Characteristics of living systems that are resonant in terms of culture or heritage | Public awareness<br>Extension of protected areas |
| | | | Characteristics of living systems that enable aesthetic experiences | Scenic beauty score |
| | | mbolic and other s with natural nt | Elements of living systems that have symbolic meaning | Public awareness |
| | | | Elements of living systems used for entertainment or representation | Charismatic biodiversity |
| | | Other characteristics that have a non-use value | Characteristics or features of living systems that have an existence value | Red List Index - threatened species |
| | | | Characteristics or features of living systems that have an option or bequest value | Willingness to pay (WTP) |
| | | Other characteristics of living systems that have cultural significance | Other | Income from nature-based tourism |

14 divisions, subdivided
into 53 classes with 71 indicators

(Lira et al. 2020)

# Pilot demonstrations

| Nr. | Region | Short characterisation | FES considered | Business Modell |
|---|---|---|---|---|
| PD1 | ZIF_VS Northwest Portugal | pure and mixed mediterranean forests of eucalypt (*E. globulus*) and maritime pine (*P. pinaster*), land owned by communities, private and non-industrial owners | TB, CB BD, RC, NHR | BM1, BM2, BM3, BM4 |
| PD2 | Käringberget, Västerbotten, Boreal zone, Sweden | Boreal forest dominated by Scots pine(*Pinus sylvestris*) and Norway spruce (*Picea abies*), forest land owned by state owned company | TB, NTFP, RC, CB | BM1, BM2, BM3, BM4 |
| PD3 | Cerdanya, Pyrenees, Catalonia in northeast Spain | mixed mediterranean forests of Pine (*Pinus sylvestris, Pinus uncinata)* and fir*(Abies alba)* forests owned by municipalities | TB, NTF CB, BD, WSR, N | |
| PD4 | Ausseerland Austria | Montane to subalpine mixed forests of N. Spruce, (*Picea abies*), E. Beech (*Fagus sylvatica*), Silver Fir *Abies alba)* and E. Larch (*Larix decidua*) private and state owned | TB, NT BD, RC | |
| PD5 | Lorraine, Northeast France, | Forests are dominated by sessile oak (*Quercus petrea*), and E. beech (Fagus silvatica), forests are mainly privately owned, a third is owned by municipalities | TB, C | |

**Forest ecosystem services:**
**TP** : timber production
**NTFP** : non-timber forest products
**CB**: carbon sequestration
**RC**: recreation (sports, hunting)
**BD**: biodiversity conservation
**WSR**: water, soil and nutrient regulation
**NHR**: natural hazard regulation

**Business Models:**
**BM 1 Value-Added Goods and Services:** private households companies directly pay for goods and services that have ec embedded (e.g. ecotourism, certified wood products)
**BM 2 Voluntary PES:** voluntary payments of private house companies, companies may pass the costs to their clients
**BM 3 Selling ES to Government Agencies**: Local / national governm providers for the service and pass the costs to consumers via taxes or fees fees
**BM 4 Business as usual:** FES providers are selling timber and non timber forest products on the market

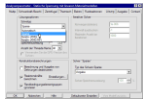
## Design innovative forest management plans

Predict effects of forest management with ecosystem models

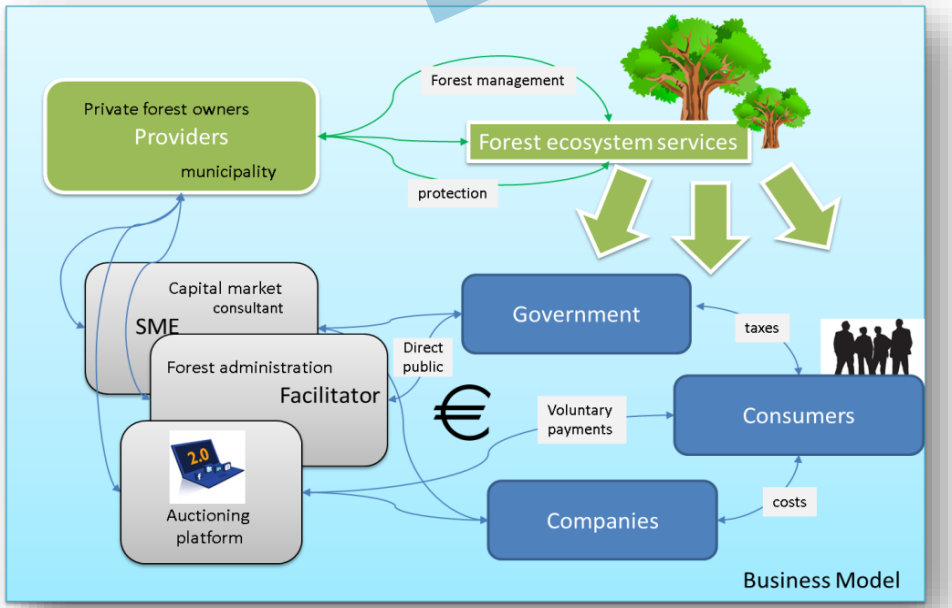
## Identify business relations

quantification of FES with indicators

assess economic value of FES



quantify acceptable value trade-offs with optimization tools




methods and mechanisms for web-based auctioning

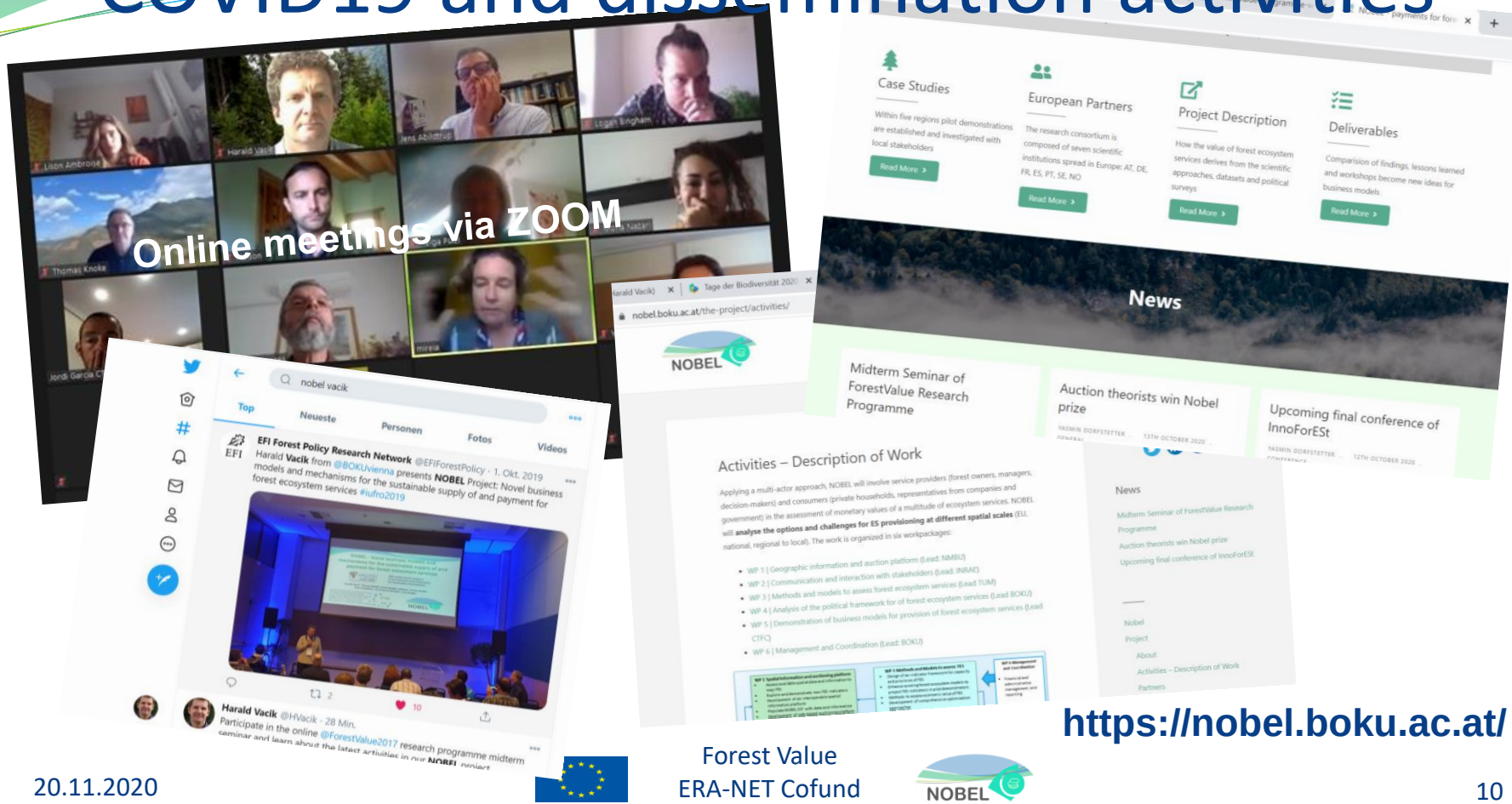
implement business models

# Auctioning platform



(Tóth et al. 2010, 2013)

# COVID19 and dissemination activities




**https://nobel.boku.ac.at/**

# NOBEL Partners

- Forest Sciences and Technology Centre of Catalonia, Spain
- French National Institute for Agricultural Research, France
- Norwegian University of Life Sciences, Norway
- School of Agriculture / Instituto Superior de Agronomia, Portugal
- Swedish University of Agricultural Sciences, Sweden
- Technische Universität München, Germany
- University of Natural Resources and Life Sciences Vienna, Austria

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