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Woody biomass from permanent crops (olive groves, vineyards, fruit orchards)

...Agrarian Pruning and Plantation Removal (APPR)
The European APPR biomass potential is huge

TOTAL pruning potential
> 13 Mt (dry matter) pruning
(eq. to 26 Mt of fresh matter)

TOTAL APPR potential
> 20 Mt (dry matter)
(eq. to 40 Mt of fresh matter)
If there is a huge potential why isn’t it used?

**EXISTING BARRIERS**

- APPR largely spatially dispersed
- Low economic value of pruning
- Energy Policy unstable
- Lack of market driven incentives
- General scepticism of market actors
- Matter of secondary interest for society and policy makers

**POTENTIAL DRIVING FORCES**

- Greening the economy
- Circular economy
- Large potentials available
- Diversifying rural economies
- Improve air quality and reduce CO2 emissions
- Public initiatives exemplifying
Our mission

uP_running project aims to unlock the EU strong potential of APPR wood and promote its sustainable use as energy feedstock
Who are we?
The uP_running Observatory and APPR value chains identified

http://www.up-running-observatory.eu

- **20 existing value chains** identified so far
  - Visualized on the uP_running Observatory using a standardized template
  - More cases to be recorded
- **5 flagship cases** studied in detail
  - At least 5 more to be selected and studied till end of project

<table>
<thead>
<tr>
<th>APPR biomass mobilized per case (t/y)</th>
<th># cases</th>
<th>Type of cases</th>
<th>Flagship cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 500</td>
<td>12</td>
<td>Domestic heating (self-consumption) or other heating applications (e.g. municipal heating, small agro-industries)</td>
<td>Domaine Xavier Muller (FR), Vineyards4heat (ES)</td>
</tr>
<tr>
<td>500 – 2,100</td>
<td>3</td>
<td>Heat production in larger agro-industries, co-firing fuel for biomass CHP / power plants</td>
<td>ITC Shabo (UA)</td>
</tr>
<tr>
<td>8,000</td>
<td>1</td>
<td>Power production (exclusively from APPR)</td>
<td>Fiusis (IT)</td>
</tr>
<tr>
<td>Up to 20,000</td>
<td>2</td>
<td>Large-scale pellet / chip production (exclusively from APPR)</td>
<td>Pelets de la Mancha (ES)</td>
</tr>
<tr>
<td>&gt; 84,000</td>
<td>2</td>
<td>Power production (APPR biomass as co-firing fuel)</td>
<td></td>
</tr>
</tbody>
</table>
APPR value chains: the keys to success

Policies, regulations, incentives

Social perception favorable

All value chain actors should obtain a benefit

Benefits

Tangible
- New incomes
- Economic savings
- Time savings, etc.

Intangible
- Avoid pests
- Avoid fire risks
- Reduce CO$_2$
- Image of sustainable business
- Differentiation from competence
- Independence from fossils, etc.
The Vineyards4heat case

Developing APPR biomass utilization in the frame of a public-private partnership
Vineyards4heat: a public-private partnership

- Location: Vilafranca del Penedés, Spain
- Private and Public actors join forces for the production of heat from vineyard prunings
- Initiated in 2015
- APPR biomass mobilization: 225 t/y (vineyard prunings) during the project
  - Potential can be up to 30,000 t/y
- Biomass sourcing radius: 15 km
- Total investment: 600 k€
- Job creation: 4 permanent jobs in the logistics chain
- GHG emissions avoidance: 125 t of CO₂ in 2016
- Best LIFE project award, category “Climate Action”
## Vineyards4heat: a public-private partnership

**Manual pruning and preparation of branches**

- Integrated collection with shredding
- Download on truck at field side
- Storage in a roofed facility
- Transport to final users
- On-site storage and energy conversion

### Farmers

- **NOU VERD**

### Vilarnau, EMAVSA

### Benefits

**Tangible**

- Save time and money in pruning residues management
- Get economic margin
- Diversify activities
- Lower energy cost
- Reduced municipal taxes
- Improved air quality
- Promote successful utilization case of prunings
- Job creation

**Intangible**

- Avoid risks of fires and diseases
- Avoid pollution due to open-field burning of prunings

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**NOU VERD**

- Integrated collection with shredding
- Download on truck at field side
- Storage in a roofed facility
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**Farmers**

- Manual pruning and preparation of branches
Vineyards4heat: a public-private partnership

District heating of Vilafranca del Penedes

- Storage of hog fuel (1,000 m³ annually) during November-June in roofed and paved area in piles of 100 m³
- Cost of vineyard pruning 70 €/t at 20 % moisture (4.72 €/GJ)

Conversion technology

- Hog fuel consumed: 20 % moisture, 6 % ash (dry basis), LHV 14.8 MJ/kg, PSD G50

District heating located in Vilafranca del Penedes

- Supply heat and hot water to 4 public buildings
- Boiler Heizomat RHK-AK-500 (500 kW)
- Boiler runs on 100% vineyards prunings hog fuel
Success factors – Innovations during the implementation

- Alliance among diverse local key actors boosted the starting of pruning utilization (private/public consortium to use pruning for heating in public schools)
- Expansion of role and status of the local water management public company to provided of energy services
- Adapted technology to burn 100% hog fuel from vineyard pruning
- Prototype of “pre-prunner”, but failed during pilot tests (too many losses of material)
The Pelets de la Mancha flagship case

Using APPR biomass to produce upgraded fuels (pellets and chips) for the market
Location: Socuéllamos, Spain
Largest pellet plant from APPR biomass in the world
Initiated in 2011
Production of wood pellets & wood chips from 100% vineyard prunings
Up to 20,000 t/y APPR mobilized
15 jobs created
Sourcing radius: 30 km
Total investment: 5.8 M€ (initial cost)
Logistics operations for loose branches

Prunings left for 60 – 90 days on the field to reduce moisture content to 30 %
Extensive pre-treatment required to lower soil and fine materials in the final products

100 % use of vineyard prunings (no other wood sources or even vineyard stocks)

**Pellets**
- Mostly for public / private customers for heating purposes and industrial units
- About 30 % cheaper than alternative industrial pellets

**Wood chips**
- Mostly for biomass power / CHP plants
- Different particle sizes (P20, P40 or larger) and moisture content depending on customer specifications

Other markets for pellets and chips: horse bedding, barbeques
Success factors – Innovations during the implementation

• Development of the logistics system together with farmers and local service companies. It had to be a compromise between farmer needs and capabilities, and the final product requirements.

• Development of the pre-treatment process to remove the inorganic material collected during biomass harvesting. Several steps, complex process: not disclosed by the company.
The Fiusis power plant flagship case

Using APPR biomass as a fuel for power production
• Location: Calimera, Italy ("Grecia salentina")
• First power plant in the world (1 MWe) fueled **exclusively** by olive tree prunings
• Initiated in 2010
• APPR biomass consumption: 8,000 t/y (olive tree prunings)
• Sourcing radius: 10 km
• 60 % (1,200) of the local farmers are involved in the scheme
• Total investment: 8 M€
• Job creation:
  o 6 permanent jobs created at the energy plant
  o 10 permanent and 5 seasonal jobs for the logistics chain
• GHG emissions avoidance: ~ 5,300 tCO$_{2eq}$/y
Logistics operations for fields < 400 trees

Three FACMA TR200 harvesters in operation

Each capable of up to 20 – 25 tons of prunings per day (usually 18 t/d considering movement times)

Results in hog-fuel production
Logistics operations for fields > 400 trees

- Manual pruning and preparation of branches
- Forwarding prunings to piles
- Biomass piles at field side
- Chipping: static chipper fed with hydraulic arm mounted on spider. Direct discharge on truck or trailer
- Transport to plant
- On-site storage and energy conversion

Work platform with hydraulic arm and a spider grabber

Caravaggi shredder, production capacity of 10 t/h

Results in more uniform particle size
Success factors – Innovations during the implementation

• Power plant fueled by 100% olive pruning. Profitability supported by a high feed-in tariff (28 c€/kWh) for 15 years
• “Ligna” subsidiary established to avoid expensive external contractors for logistics operations. Two main logistic operations (with different machinery) depending on the tree density in the olive groves.
Concluding remarks
To sum up

- Wood from APPR is a relevant renewable energy source, but still not used or largely under-used.
- Setting up APPR value chains requires significant efforts and a change in agronomic practices.
- APPR value chains are very versatile. Many different models exist and depend on local conditions and peculiarities.
- APPR value chains are mostly local, with a geographical sourcing radius below 30 km.
- Involvement of local actors and local acceptance is a prerequisite for success.
- APPR value chains constantly evolve, adapting to local and changing market conditions, refining business model and logistics, and developing new products.
Many more success cases are to be found all over Europe!

Work with us to visualize your case at the uP_running Observatory and – maybe – become the next “flagship” case!
Take-off for sustainable supply of woody biomass from agrarian pruning and plantation removal

Thank you very much for your attention!

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