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### OPPORTUNITIES OF WOOD FROM AGRARIAN PRUNING AND PLANTATION REMOVAL ENERGY UTILIZATION

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Biomass

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Agrarian Pruning: operations carried out annually, biennially, or every several years.



Plantation Removals: operations of restoring the field to an initial stage for starting a new crop cycle.





- European potential of wood from pruning and plantation removal is huge (> 20 Mt/y dry matter)
- 2. Ukraine's potential: 256 kt d.m./yr (117 ktoe/yr)



3. Field measurements in the territory of Ukraine:

Orchards: 1.6-5.9 t/ha/year of pruning, 19.3 - 56.3 t/ha of ground tree part

Vineyard: 2.2 to 4.4 t/ha of pruning each year.

Depending on the harvesting technology, biomass losses are at the level of 7-15%.



1. APPR energy use is technically feasible and several success cases demonstrate it



Private - Public Partnership for the production of heat from vineyard prunings (Villafranca del Penedés, Spain)



Example 2: Use of vineyard pruning for process steam production at winery (Odesa region, Ukraine). Biomass producer is Agro-firm Shabo; biomass consumer is winery Shabo.

- 2. Its utilization is a straightforward strategy for:
  - Diversifying the activity of the primary sector
  - Creating value in rural areas
  - Contributing to European strategies for climate change, rural development, circular economy and bioeconomy

But ...

... the (initial) situation is of stagnation and general skepticism

# Demonstration of 5 new value chains in Ukraine

### Support entrepreneurs for their decision-making

- Field measurements of pruning productivity
- Business model prospection
- Field tests of biomass collection and treatment
- Analysis of the biomass produced and validation in potential end-users
- Techno-economical feasibility analysis
- Assessment of soil conditions and GHG emissions









# **Demonstration Projects in Ukraine**

Prime Mover	Type of APPR biomass produced		Stakeholder type		
PrMov1. Vinnytsia regional administration	Wood chips from pruning of app trees		Local authority/promotion of fossil fuels substitution by biomass		
PrMov 2. Triada-MK Ltd.	Pellets from planta fruit tr	tion removal of ees	Farmer/Fruit company, new initiative on selling product		
PrMov 3. Novooleksandrivske PJSC	Hog fuel (branc pruning of ap	h logs) from ople trees	Farmer/Fruit company, self- consumption of APPR residues		
PrMov4. Bolgrad city council	Briquettes from vineya	n pruning of rds	Local authority/promotion of fossil fuels substitution by biomass		
PrMov 5. Black Sea fruit company Ltd.	Wood chips from p trees	runing of apple	Farmer/Fruit company, self- consumption of APPR residues		
Manual pruning and preparation of branches	Biomass transpor- tation	s Biomass Briq milling produ	uette tation to uction final consumers	Energy conver- sion	
Farmers	Briquette producer			Final onsumers	

Fig.1. Logistic chain of briquettes production during the demonstration based on Bolgrad City Council

# Main properties of the APPR biomass produced during demos in UKRAINE

PrMov	APPR produced	Photo	LHV MJ/kg, a.r.	Moistu re % a.r.	Ash % d.b.	Particle Size	Bulk density <i>kg/m³, a.r.</i>
1	Wood chips from pruning of apple trees		10.9	34.3	2.0	P45B (EN 14961-1)	270
2	Pellets from plantation removal of fruit trees		15.3	12.6	4.8	Diameter 8 mm Different length, up to 40 mm	530
3	Hog fuel (branch logs) from pruning of apple trees		8.5	46.2	2.3	P125 (EN 14961-1)	270
4	Briquettes from pruning of vineyards	UBD UBD	15.9	11.0	3.4	Diameter 50 mm Different length (average 60 mm)	760
5	Wood chips from pruning of apple trees		12.9	41.5	4.3	P100 (EN 14961-1)	280
d.b. Dry EU star	d.b. Dry Basis, a.r. As Received EU standards were used: EN 14774-1, EN 14775, EN 15103						

## **Results of the new value chains demonstration**

#### Validation and market value

- 5 combustion tests of APPR biomass demonstrated to the end consumers the similar boiler performance characteristics as forest wood shows. All end consumers confirmed their readiness to buy hog fuel, wood chips, briquettes and pellets from APPR biomass.
- 2 new value chains are under implementation (selling of pellets, chips self-consumption).

#### • Economic parameters and GHG emissions:

APPR type	Business model	IRR	Potential GHG savings, tCO2,eq/y	GHG emission reduction, %
Chips from pruning of apple trees	heating in municipal buildings with pruning from local farmers	18.4%	1,185	95.17
Pellet from plantation removal of fruit trees	agro-pellet production for heating in local industries and buildings	33.5%	1,520	83.49
Hog fuel from pruning of apple trees	heating in local facilities with pruning from an individual farmer	16.2%	111	94.05
Briquettes from vineyards pruning	heating in municipal buildings with vineyard briquettes	42.3%	169	90.77
Chips from fruit trees pruning	self-consumption at fruit company offices and selling to local heating facilities	42.1%	303	95.03



# Lessons learnt (1/2)

- The supported initiatives are based on a **local use** of APPR biomass (up to 35 km).
- Many different models exist and depend on local conditions and peculiarities.
- The final APPR product uses to be **in form of a hog fuel/chips** obtained either by a manually fed shredder, a harvester with integrated-shredder or a large static shredder.
- The **cost of APPR biomass at gate** varies greatly depending on the logistic scheme and machineries used, as well as the APPR productivity and many other factors.
- The **particle size distribution** may limit the use of this fuel in existing biomass installations. It is necessary to reduce impurities in biomass, in particular, soil particles and to ensure the required quality characteristics.
- It is absolutely necessary to start the value chain with end-users in mind and examining in detail their capacity to handle APPR biomass.







# Lessons learnt (2/2)

- Starting new APPR value chains requires efforts and a change in agronomic practices.
- The economic margins are tight, but **social and environmental benefits** may play a crucial role, e.g. avoid open burning, avoid plant diseases, improve business image, etc.
- Thousands tons of CO<sub>2</sub> equivalent emissions may be saved yearly thanks to APPR mobilization: calculated GHG savings are between 83% and 95% compared to fossils.
- For single farmers or cooperatives, the **investment capacity is limited**, and the payback time for chippers/shredders that are utilized only a few days per year is high.
- **Public authorities** may play a strategic role, by creating the demand or creating synergies with the management of green urban wastes.









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# Thank you very much for your attention!

