



Materials for Training

Deliverable 4.1

WP4. Multiplicative actions in demo countries

uP_running

Take-off for sustainable supply of woody biomass from agrarian pruning and plantation removal

Grant agreement: 691748
From April 2016 to June 2019


Prepared by: UCAB

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DELIVERABLE FACTSHEET

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WP: 4. Multiplicative actions in demo countries
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Approvals

	Company
Author/s	UCAB
Reviewers	CIRCE
Contributor	All partners
Task Leader	UCAB
WP Leader	UCAB

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ABBREVIATIONS

APPR	Agrarian Pruning and Plantation Removal
AP	Agrarian Partners
DC	Demo Countries
CERTH	Centre for Research and Technology Hellas
CHP	Combined heat and power
CIRCE	Research Centre for Energy Resources and Consumption
EC	European Commission
PrMov	Prime Mover
SECB	Scientific Engineering Centre “Biomass”
SWOT	Strengths, Weaknesses, Opportunities and Threats
TP	Technical Partners
UCAB	Association “Ukrainian Agribusiness Club”
UFG	University of Foggia
VC	Value chain
WP	Work Package

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EXECUTIVE SUMMARY

Capacity building and multiplicative activities are the key parts of the **uP_running project** through which the partners will reach sustainability. This includes two main components, among others: 1) developing training materials (Handbook for consultancy and Power Point presentation), 2) organizing training courses.

Training materials include the Handbook for consultancy, training presentations in Power Point, monographs, flagship success cases, observatory, videos, etc. They accumulate experiences gained by partners within sector analysis and demo activities. Based on these experiences, partners are going to deliver competences to the consultants which later will provide consultancies to entrepreneurs about the best way to develop a value chain using APPR biomass.

Trainings will be organized in a coordinated way in 8 EU countries (Belgium, Spain, Italy, Greece, Ukraine, France, Portugal and Croatia). Trainings will include one online session (“knowledge pill”), one face-to-face (auditorium) session and one follow-up communication. The general duration of the course is 11 hours.

Lector will find an explanation of general objectives of the training, the overview of the target groups as well as the strategy for the training, its purpose and methodology. Materials for training presented in annexes – videos, monograph, flagship success cases on observatory, handbook for consultancy, as well as four presentations in Power point, - which will be used during the training.

All these training materials will be translated by the partners in all project languages and published on the uP_running project website.



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1 INTRODUCTION

Having discussion with different stakeholders interested in developing a new value chain based on APPR biomass, it was found out that one of the most common problems in all demo countries is lack of knowledge and low awareness. In general, the number of success cases is still limited; in many cases those entrepreneurs who have started developing a new value chain are not willing to share their experience, sometimes because of the lack of time, in other cases just to avoid a simple competition. Negative experience or failed cases, on the other hand, spreads out much faster and bring the entrepreneurs to the idea that biomass from Agrarian Pruning and Plantation Removal (APPR) is “unfeasible” for energy purposes.


To break down such unawareness, skepticism and negative attitude, there is a strong need to build-up capacities for consultants in Europe. uP_running considers capacity building as one of the key part of the project through which the partners will reach sustainability. Thus, such kinds of “trainings for trainers” (or consultants) will be organized in all demo countries of the project (Spain, Italy, Greece, Ukraine) as well as outreach countries (France, Croatia, Portugal).

The target of uP_running training is not to educate “deep experts in APPR” but rather to share own experience gained within the project implementation and provide the future consultants with main tools, so they will be able to:

- ✓ Support the entrepreneurs: “Yes, it is possible”
- ✓ Provide him/her with materials, data, examples of existing value chains
- ✓ Accompany and help him/her to understand if the initiative makes sense, which are the main deficiencies or risks
- ✓ Help him/her to take decision and identify which should be the next steps for implementing the initiative

To reach these objectives, the “Training for trainers” will be structured into two main sessions: a 4-hours on-line session (“knowledge pill”) and a 6-hours face-to-face session. In the first one, the main goal is to give a first insight into the energy use of APPR biomass and to transfer basic knowledge related to that subject. Respect to the auditorium session, the aim is that trainees learn how to use the Consultancy Handbook and get trained with some examples. All the training materials (the Handbook for Consultants, Power Point presentations and others) will be available on the project web page in English and all project languages (as public deliverables).

Mostly, these materials are composed of written and audiovisual documents developed by partners during the project – e.g., the sector analysis or the demo activities. Training materials will give the future consultants general information about energy use of APPR biomass and, most of all, a methodology for a step-by-step consultancy (or “diagnose”) to support new APPR initiatives. The consultants that received the training will be able to carry out such diagnose, supported by the project partners. In that manner, transfer of knowledge and capacities will be achieved before the end of the project.

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Finally, the future consultants may use directly these materials (e.g., to prepare an argumentation or a meeting with the entrepreneur) or they may facilitate one or several of these documents to the entrepreneurs they support (e.g. a video of a machine they may be interested in, or a success case that may be similar to the initiative they pretend to start).

2 TRAINING FOR TRAINERS

2.1 Objectives

The main objective of the training is focused on providing knowledge and transferring competences to participants (the “Consultants”) who later will provide consultancy to entrepreneurs (i.e., farmers, cooperatives, etc.) eager to implement a new value chain based on APPR biomass.

Upon completion of this training, the trainee is expected to be aware of:


- 1) the importance of renewable energy from APPR biomass, as well as the main issues and benefits from this type of biomass
- 2) an step-by-step methodology to give valuable support for entrepreneurs (farmers/cooperatives/other companies that are interested in starting new value chains based on this APPR biomass)
- 3) some examples of APPR consultancies, as the ones carried out during uP_running demonstrations

2.2 Target groups for trainings

The training participants can be any person that is interested in getting additional knowledge on APPR biomass and in receiving formation to support new entrepreneurs to scope their initiatives in APPR:

- farmers
- cooperatives or companies interested in learning more in APPR
- consulting services companies
- representatives of associations
- practitioners from interested non-governmental organizations
- technicians from agrarian farms/cooperatives/associations
- practitioners representing government agencies related bioenergy
- energy services companies who install biomass plants and want to understand better APPR
- engineer that are in contact with agrarian and/or energy sectors
- technicians from wineries or agro-industries
- representatives of universities: lecturers in agrarian/bioenergy courses
- etc.

In general, everybody who may be interested in knowing more about APPR biomass and receiving a methodology to begin an initiative based on this kind of biomass.

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2.3 Methodology

The training is structured into two main sessions – online (distance) session and face-to-face session. Moreover, a follow-up communication is included after the last session, in order to resolve potential questions and doubts, as well as discussing the future consultancies to be carried out. Such approach will let the trainees (future consultants) get the first portion of information through a “knowledge pill”, study it in suitable time for them and be prepared for the next auditorium session. From other side, uP_running partners (the trainers) will concentrate mostly on practical issues of main interest for trainees and will avoid repeating the work already outlined in the project public documents and publications.

Training course structure and main objectives are summarized hereinafter and in Figure 1:

1. Online (or distance) session. Duration – 4 hours.
Objective: To give first insight into APPR biomass for energy and transfer basic knowledge using the monograph, videos, and presentations.
2. Face-to-face (auditorium) session. Duration – 6 hours.
Objective: To learn how to use the Consultancy Handbook and get trained with some examples
 - Acquire essential consulting skills collecting, analysing, and presenting data
 - Learn most usual consultant questions and doubts in the areas of APPR biomass mobilization and value chains development
 - Learn how to perform the consultancy (according to Handbook of Consultancy)
3. Follow-up communication with those who have doubts/questions and discussion of potential beneficiaries of consultancy. Duration – up to 1 hour

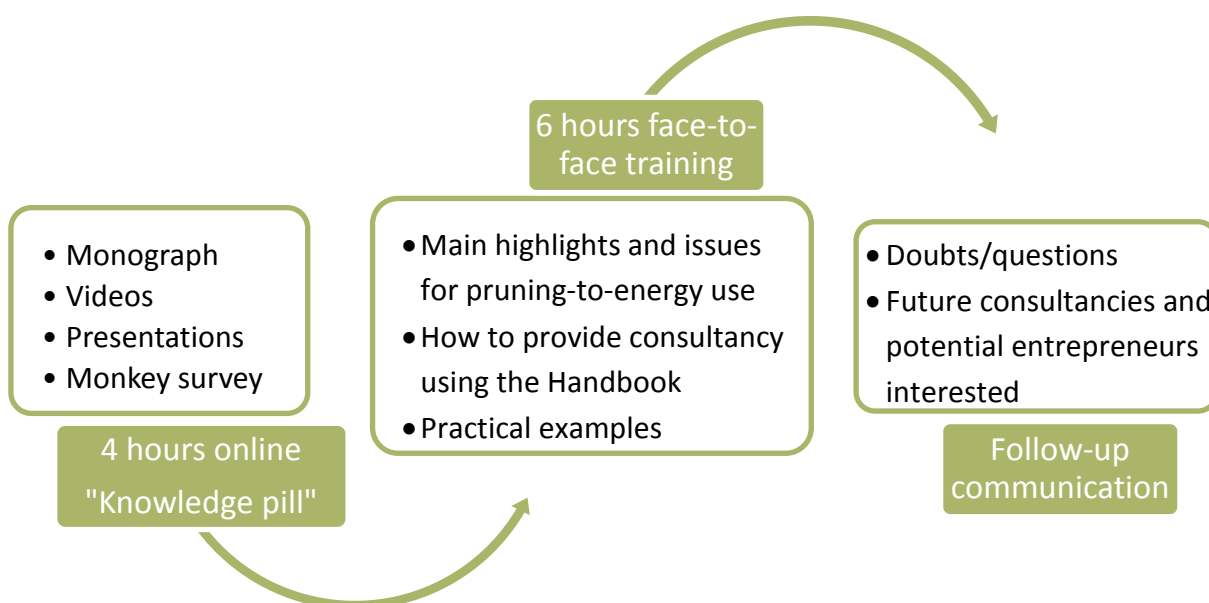



Figure 1. Roadmap for training implementation

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2.4 Materials for each training session

2.4.1 First online session

In this first session, the trainees receive a “knowledge pill”, in order to get aware on main facts of APPR biomass for energy. This knowledge pill includes both audiovisual and written documents, as described in next Table. Afterwards, trainees will receive a monkey survey in order to identify their real interest for the auditorium session. For sake of convenience, all these materials are gathered in the Annexes.

Table 1. Set of materials included in the “knowledge pill” (first online session)


Nº	Name	Type	Contents
1	Training’s introduction	Video	- Introduction to uP_running project - Structure and objectives of the training
2	Monograph: “Biomass from agricultural pruning and plantation removals: a feasible practice promoted by uP_running”	pdf	General overview on the issues related to start up new initiatives and with a specific insight into the organization of the value chain operations: - how to collect and mobilize APPR wood - how to maintain biomass quality and transform it to energy - how to organize the value chain actors
3	Flagship success cases	pdf	5 examples of existing value chains based on APPR: business models, success cases, main actors, data, etc.
4	uP_running demo experiences	Videos	Short presentation of the demonstrations carried out in Spain, Greece, Italy, and Ukraine
5	Monkey survey	Google form	Questions about training and further interest in attending the auditorium session

Benefits for consultants

After this first online session, the trainees will be aware of main issues related to the implementation of a new APPR value chain: there exist numerous forms to harvest and treat the wood from APPR, it is important to keep in mind the biomass quality and some keys for success, etc.

2.4.2 Auditorium session

During the 6-hours auditorium session, attendees will get trained on how to perform a consultancy to farmers, cooperatives or companies that are interested in starting a new value chain based on APPR biomass: steps to be done to understand the needs of the entrepreneurs, to identify possible existing chains, and to perform the general diagnose for the client.

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Accordingly, materials for this session will include mainly Power Point Presentations, in addition to the “Handbook for consultancy” (public deliverable D4.2). All these materials may be found in the project website.

Table 2. Set of materials included in the 6-hours auditorium session


Nº	Name	Type	Contents
1	Main highlights and issues for energy use of APPR biomass (<i>equiv. 2 hours</i>)	PPT	- Status of APPR biomass in Europe - Understanding APPR value chains
2	Description of the Handbook and the methodology for consultancy (<i>equiv. 2 hours</i>)	PPT	- Aims of the consultancy and the role of consultants - Methodology for APPR consultancy or “diagnose” - Tools and recommendations for future APPR consultants
3	Example of consultancy in Ukraine (<i>equiv. 1 hour</i>)	PPT	Application of the consultancy methodology in Ukraine (based on demo case realized within the project)
4	Example of consultancy in Spain (<i>equiv. 1 hour</i>)	PPT	Application of the consultancy methodology in Spain (based on demo case realized within the project)
5	Handbook of consultancy	pdf	- Consultancy services for implementing new APPR value chains - Main phases for the consultancy or “diagnose” - Links, materials and templates

Benefits for consultants

After the auditorium session, the trainees will understand the consultancy process (i.e., a “diagnose” of the entrepreneur’s initiative) and will be able to suggest the possible models and/or recommendations for implementing a new APPR value chain, or improving an existing one.

2.4.3 Follow-up communication

This last session will be done via mails, phone, or video conference, on the request of trainees or by initiative of the project partners. It will involve those trainees who have doubts/questions about the training materials, as well as the purpose and methodology of the future consultancies. Furthermore, it may be a space to discuss on the identification of potential beneficiaries for these consultancies.

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3 FINAL REMARKS AND CONCLUSIONS


Training materials are the result of knowledge and experience gained by partners through previous activities of uP_running project. The main aim of the training is not to educate “deep experts in APPR” but rather to share experience and provide the consultants with specific tools to make a “diagnose” of future pruning-to-energy initiatives.

These “trainings for trainers” will be organized in Brussels in English and then in the seven countries of the project: Spain, Italy, Greece, Ukraine, France, Croatia and Portugal.

These training materials include four Power Point presentations, the uP_running monograph, the videos of uP_running demonstrations, the analysis of flagship success cases and, finally, the Handbook for consultancy. All together, they provide a systematic knowledge about APPR biomass as well as about key points on how to make a consultancy service to support the implementation of a new APPR value chain or improvement of existing one.

Lectors can find this set of training materials on the project website; they are available in English, as well as all project languages (Spanish, Italian, Greek, Ukrainian, French, Portugal and Croatian).

After training, the consultants will be proposed to apply the “APPR diagnose” to potential entrepreneurs interested, under the support of project partners. This process of “learning by doing” will help them to be empowered of the APPR consultancy methodology, and to support or accompany new “pruning-to-energy” initiatives.

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ANNEXES

Annex 1: Training introduction [video]

You can find it on section PROJECT MATERIALS of uP_running website

Annex 2: Monograph [pdf]

You can find it on section PROJECT MATERIALS of uP_running website

Annex 3: Flagship success cases [pdf]

You can find it on section PROJECT MATERIALS of uP_running website, specifically:

[http://www.up-running.eu/wp-content/uploads/2017/10/uP_running_D6.3-Flagship-cases-report-v1 .pdf](http://www.up-running.eu/wp-content/uploads/2017/10/uP_running_D6.3-Flagship-cases-report-v1.pdf)

Annex 4: Demo experiences [video]

You can find it on section PROJECT MATERIALS of uP_running website

Annex 5: Handbook of Consultancy [pdf]

You can find it on section PROJECT MATERIALS of uP_running website

Annex 6: Main highlights and issues for energy use of APPR biomass [PPT]

Annex 7: Methodology for Consultancy [PPT]

Annex 8: Training case in Ukraine - application of the methodology of consultancy [PPT]



Take-off for sustainable supply of woody biomass from
agrarian pruning and plantation removal

Take-off for sustainable supply of woody biomass from agrarian pruning and plantation removal: Training Session 1

Call H2020-LCE-2015-3
Coordination and support action

June 2018/UCAB



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Composition of the face-to-face training

- Main highlights and issues for energy use of APPR biomass (equiv. 2 hours)
- Description of the Handbook and the methodology for consultancy (equiv. 2 hours)
- Training case 1 for consultancy (equiv. 1 hour)
- Training case 2 for consultancy (equiv. 1 hour)



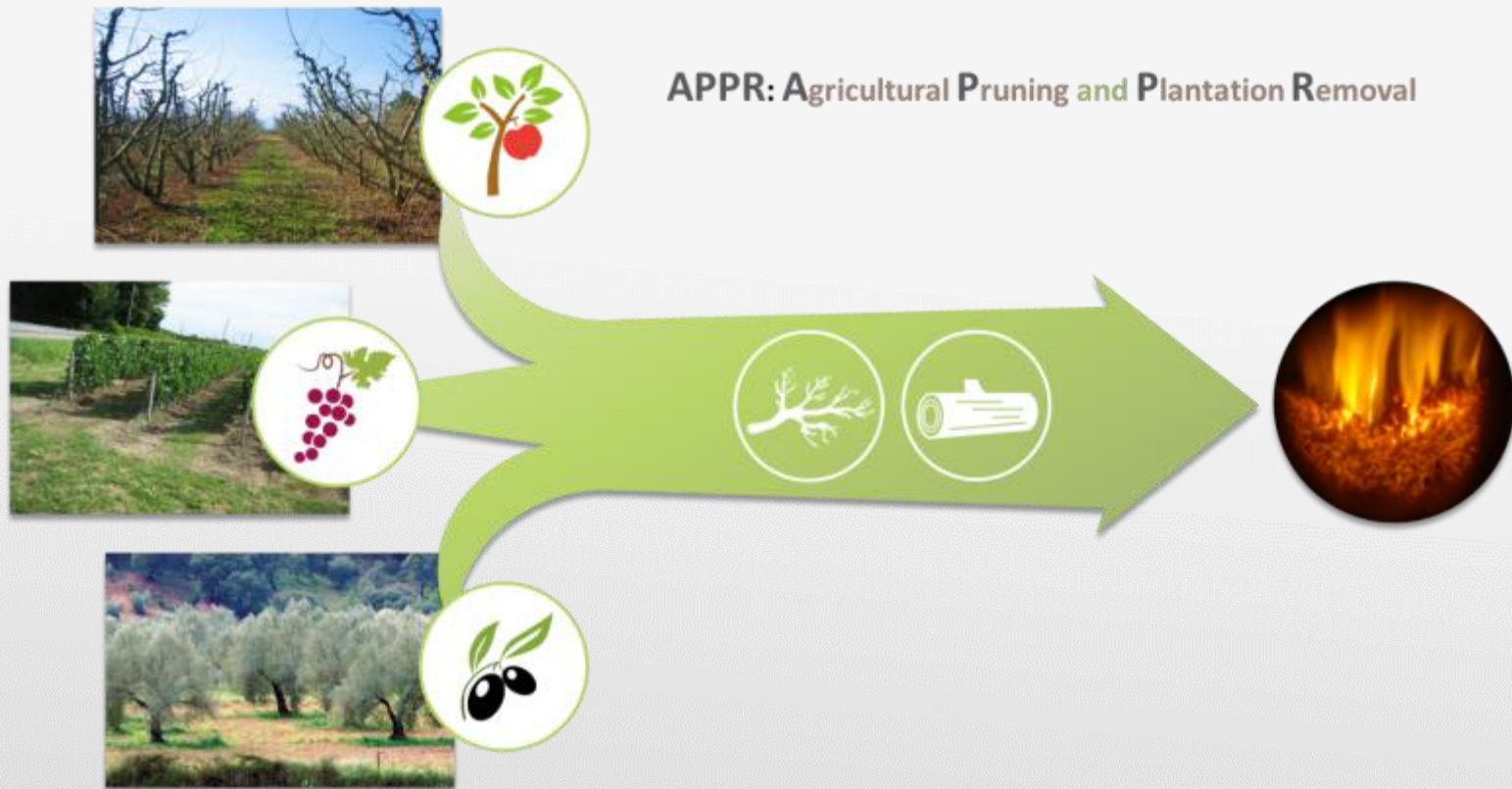
Training session 1

1. APPR biomass – What is it, how much is there, why is it not used as much and what is current use?
2. The uP_running project – A tool for the sector take-off
3. What a potential of APPR
4. Possible value chains/types of value chains
5. Successful value chains – keys for success and real examples
 - Public-private partnerships - Vineyards4heat
 - Agro-industrial utilization - ITC Shabo
 - Power production – Fiusis
6. Existing methods to collect APPR biomass
7. Pruning to energy: on the importance of quality
8. Conclusions - General remarks and lessons learned

1. APPR biomass – What is it, how much is there, why is it not used as much and what is current use?



APPR concept



uP_running: Woody biomass from ...

...agrarian pruning and plantation removal (APPR)



Overcoming current practices

Agrarian residues



Agricultural pruning



Plantation removal

Usual management



Disposal in open air fires



Mulching to soil

Alternative final uses



Composting/Energy



Firewood

2. The uP_running project – A tool for the sector take-off



What is uP_running?

Take-off for sustainable supply of woody biomass from agrarian pruning and plantation removal – uP_running project

H2020 project:



EUROPEAN COMMISSION
Innovation and Networks Executive Agency
ENERGY RESEARCH

Contract: 691748

Duration: April 2016- June 2019

Action type: CSA



Who are we?





Our mission

Actually... uP_running is a INITIATIVE to drive changes in the use of agricultural residues

**uP_running
project**

sector



**uP_running
partners**



uP_running actions





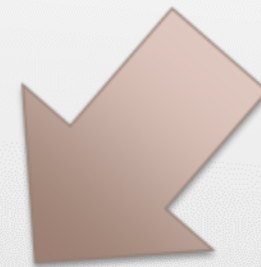
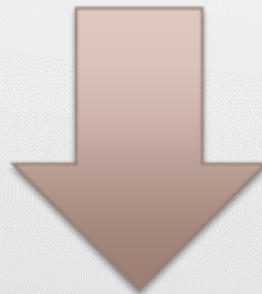
Why uP_running?

Important potentials of APPR residues in some areas in Europe

APPR residues either mulched, burnt or disposed



Sustainability, circular economy, low carbon economy, etc.



OPPORTUNITY: to promote a take-off of the APPR biomass use for energy / bioeconomy



APPR-to-energy is a reality

- More than 20 existing value chains in Europe detected by uP_running and EuroPruning projects

Observatory map of biomass from agrarian pruning and plantation removal



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

- Self-consumption for heating farms / farm-houses / small agro-industries (majority of cases)
- Heating of municipal buildings
- Heat production in larger agro-industries
- Power production (exclusively from APPR)
- Large scale wood pellets and chips production
- Power production (APPR in the fuel mix)

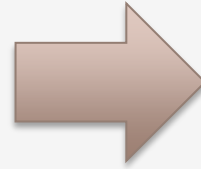
3. What a potential of APPR



The European APPR biomass potential is huge

TOTAL pruning potential

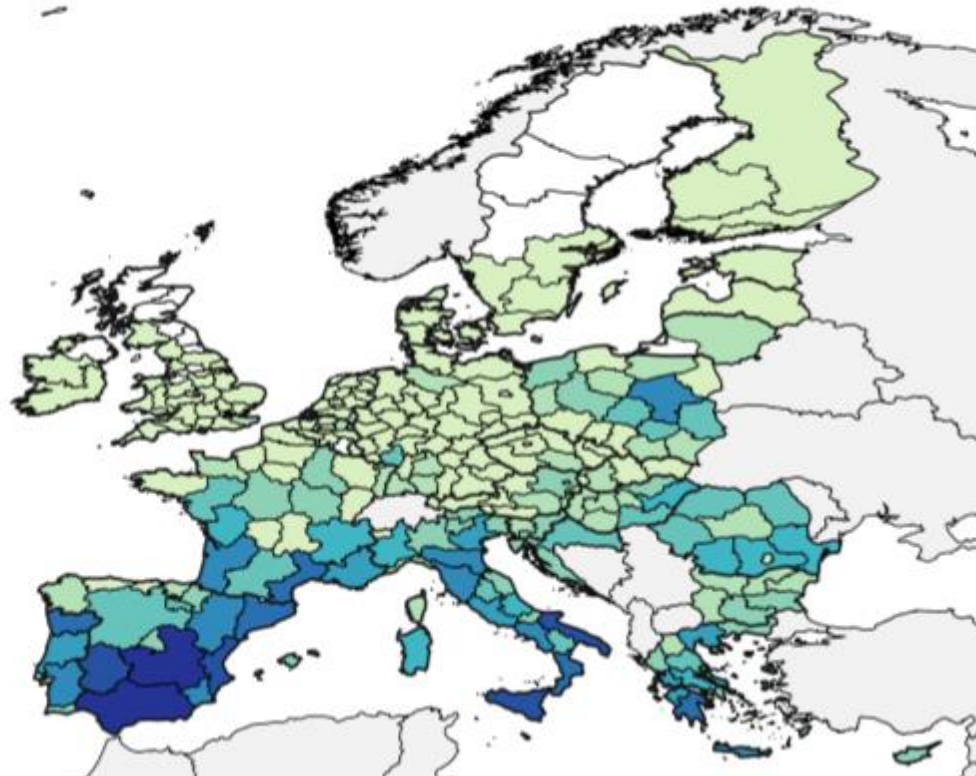
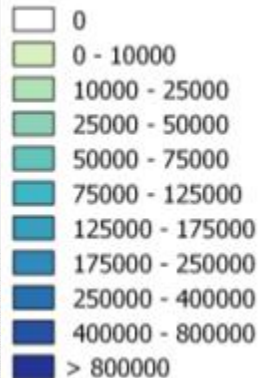
> 13 Mt (dry matter) pruning
(eq. to 26 Mt of fresh matter)



TOTAL APPR potential

> 20 Mt (dry matter)
(eq. to 40 Mt of fresh matter)

TOTAL PRUNING POTENTIAL (t d.m./yr)





Opportunity... BIG potential

TOTAL pruning potential

> 13 Mt dry matter / year

Very small use <10%

Source: EuroPruning, report D8.1

TOTAL APPR potential

(uP_running estimation)



~ 20 Mton / year > 7 Mt of oil equivalent
> 45 Bn oil barrels

	Fruit	Vineyards	Nuts	Citrus	Olive	TOTAL
AT	27,428	49,080	0	0	0	76,509
BE	34,899	0	0	0	0	34,899
BG	81,776	55,181	7,869	0	0	144,825
CY	9,629	9,062	2,978	11,900	16,373	49,941
CZ	36,307	15,058	0	0	0	51,365
DE	110,917	102,120	354	0	0	213,391
DK	3,261	0	5	0	0	3,266
EE	1,800	0	0	0	0	1,800
EL	177,701	106,975	22,502	76,227	932,835	1,316,240
ES	478,130	940,455	329,151	545,869	2,749,597	5,043,203
FI	1,110	0	0	0	0	1,110
FR	346,063	879,061	27,966	13,600	20,933	1,287,624
HR	54,945	33,484	6,526	2,495	20,351	117,802
HU	187,547	63,177	6,295	0	0	257,019
IE	945	0	0	0	0	945
IT	557,845	789,241	128,705	223,519	1,434,038	3,133,348
LT	20,621	0	74	0	0	20,695
LU	208	1,337	0	0	0	1,545
LV	9,679	0	0	0	0	9,679
MT	951	932	0	415	201	2,499
NL	30,808	63	12	0	0	30,884
PL	556,495	284	25,551	0	0	582,330
PT	84,853	199,513	76,276	27,805	294,292	682,739
RO	336,424	169,933	1,628	0	0	507,985
SE	2,844	0	0	0	0	2,844
SI	19,931	17,396	567	0	994	38,888
SK	15,275	11,583	177	0	0	27,035
UK	34,917	1,014	0	0	0	35,931
TOTAL	3,223,310	3,444,951	636,636	901,830	5,469,614	13,676,341



Opportunity... Agronomics with residues

- The use of APPR biomass can:
 - Drive a change towards more sustainable agricultural practices
 - Provide an alternative to current APPR residues disposal / treatment
 - Reduce farmers costs / concerns
 - Reduce the risks of pest and diseases propagation



Opportunity... In line with EU policies

- There is a real potential to reduce GHG emissions and achieve COP21 targets.
- Maintaining grass cover is more effective in increasing the Soil Organic Carbon (SOC) in perennial plantations than APPR biomass integration in the soil (details: Europruning D7.3, D8.1; S2biom D3.6)
- Gathering APPR biomass reduces environmental risks (fires, pests and diseases propagation).
- Multifunctionality: New job creation, allows income diversification, improves energy security, can contribute to circular economy, and reduce the chances of land abandonment.
- Circular economy and rural development are favored by local biomass consumption.



If there is a huge potential why isn't it used?





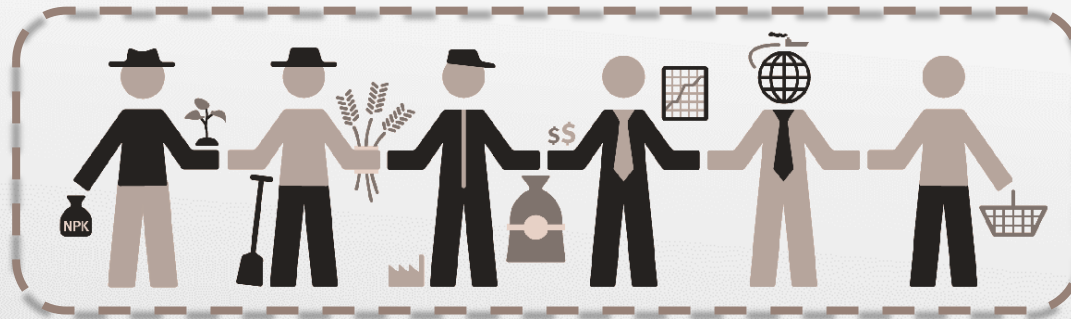
Policies, regulations,
incentives



Social perception favorable



All value chain actors should obtain a benefit



Benefits

Tangible

Intangible

New incomes
Economic savings
Time savings, etc.

Avoid pests
Avoid fire risks
Reduce CO₂

Image of sustainable business
Differentiation from competence
Independence from fossils, etc.



All actors should be on board; steps employed should be clear

- Farmers must understand that they get a benefit from the APPR management:
 - cost reduction
 - work simplification
 - less working time for residue management
- Limited interference with execution of standard agronomic practices
- Transparency in business model, difficulties, communication
- Flexible and effective operations
 - Allow different harvesting methods to increase flexibility
 - Number of available machines should be able to cope with peaks in the demand for harvesting services
 - Use advanced systems for organizing logistics
 - Avoid unnecessary operations



Question for today...



Agricultural Pruning



Plantation Removal

BUT HOW?



4. Possible value chains/types of value chains



APPR RESIDUES ENERGY

Any value chain requires all participants get a **BENEFIT**. Then it may work.

Farmer



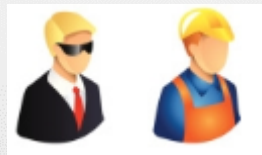
ECONOMIC

- Sells wood
- Reduce pruning management cost
- Reduce gasoil

NON ECONOMIC

- Saves time
- Avoids bothering operations
- Avoids open-fire permits

Trader / service company



ECONOMIC

- Obtain a margin of benefit

NON ECONOMIC

- Diversify their activity
- Possibility of integrated contract (pruning + collection)

Transporter



ECONOMIC

- Obtain contracts

NON ECONOMIC

- Diversify their activity
- Possibility of integrated contract (fruit + pruning wood)

Consumer



ECONOMIC

- Biomass at lower price

NON ECONOMIC

- Diversify the energy resources
- Increase competitiveness



Types of value chains

Self consumption

- Farmer or cooperative use for heating (domestic, farm, agroindustry)

Waste management / environmental action

- Municipal brigades
- Public-private joint actions
- Service companies having to find destiny for the residue

Demand driven / market orientated

- Existing / new facilities
- Pellets / woodchips for generic market

Get to know more cases...



At observatory: <http://www.up-running-observatory.eu/en/>

In our flagship reports at: www.up-running.eu

- 232 data points (t/ha) from previous research
- 105 data gathered from field by uP_running
- 15 mechanical experiences
- 18 existing value chain



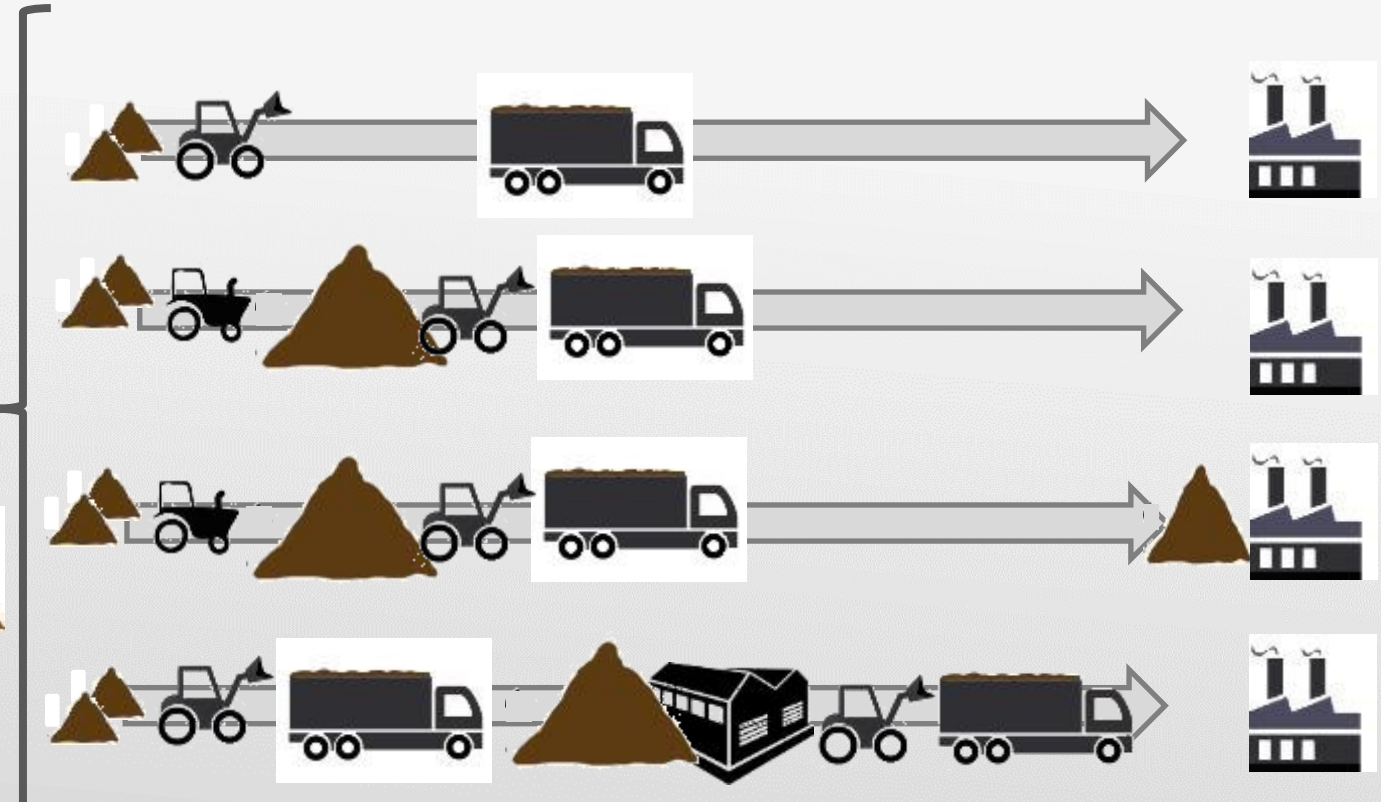
APPR to energy

The value chain management options

Collection options



Downstream supply chains





Few factors making APPR value chain possible?

1-3 t/ha
0 €/t ??



40 €/t



Lessons learned

Not always a by-product for sale, but an opportunity for farmers to save time and money

Intangible values can play a role!

It is crucial the mutual understanding and dialogue between farmer and next stakeholder in the chain.

Difficulties to penetrate market. Not compatible with regular facilities.

What else shall cause prompt changes towards extended use of APPR biomass?:

- **MARKET:**

- Petrol barrel Price
- Biomass Price and demand
- Public sector leading the change (e.g. biomass municipal heating)



- **Policy (agriculture)**

- Incentive /advantages for best practices in agro-residues management
- Obligation to withdraw APPR residues
- CAP – greening (APPR for biomass as good practice)

- **Policy (energy & environment)**

- Support to renewable power or heat
- Public procurement (e.g.: renewable energies in public buildings)
- Support by recognizing the positive role of agro-residues (e.g. in Climate & Energy policies, or in LULUCF regulations)



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

Observatory map of biomass from agrarian pruning and plantation removal



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

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

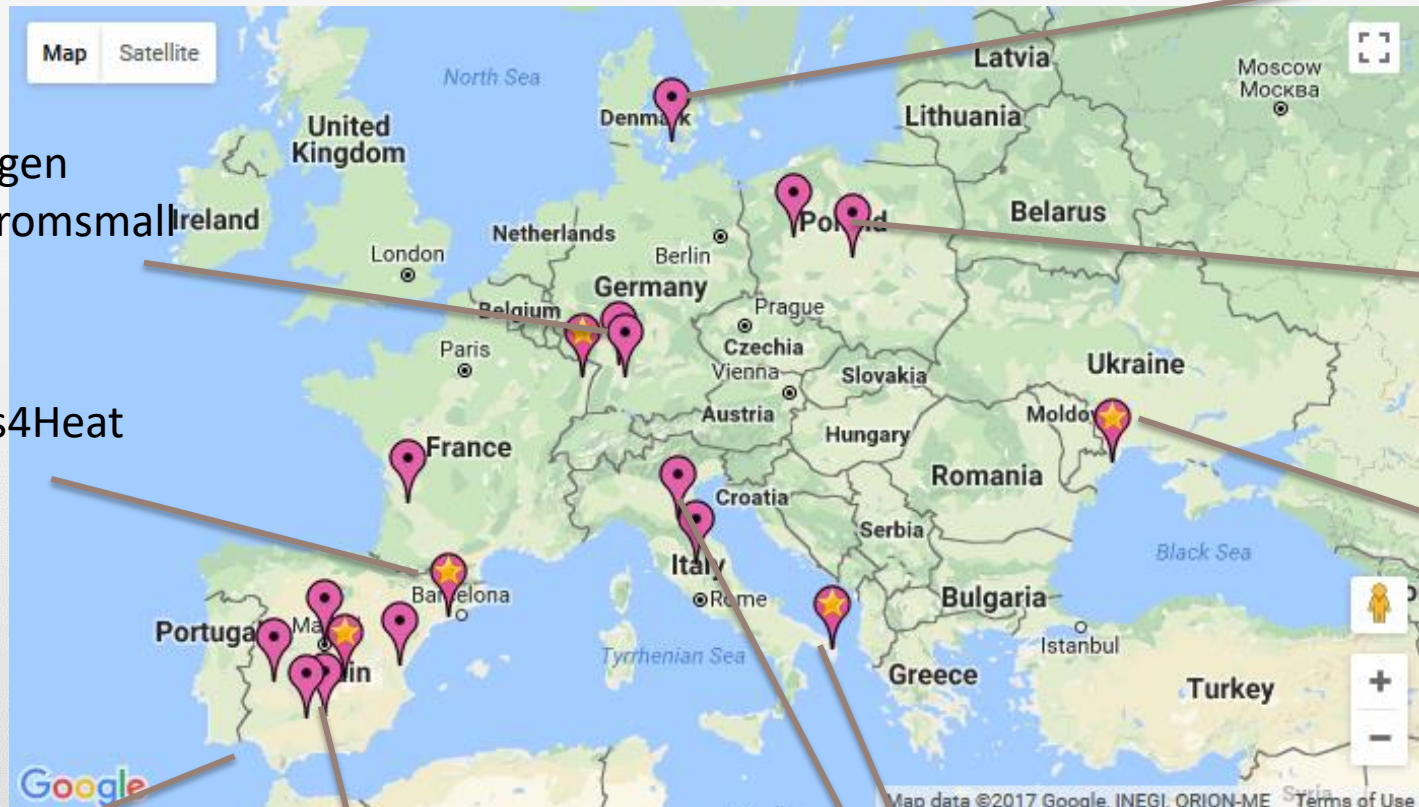


Existing value chains

- Biomass from Pruning in practice. Several examples



Vesterled frugtplant



Neuntingen
(waste from small holders)



Vineyards4Heat



Gospodarstwo Sadownicze



ITC Shabo



ENCE



El tejlar
Sacyr industrial

Fiusis
Riolo terme

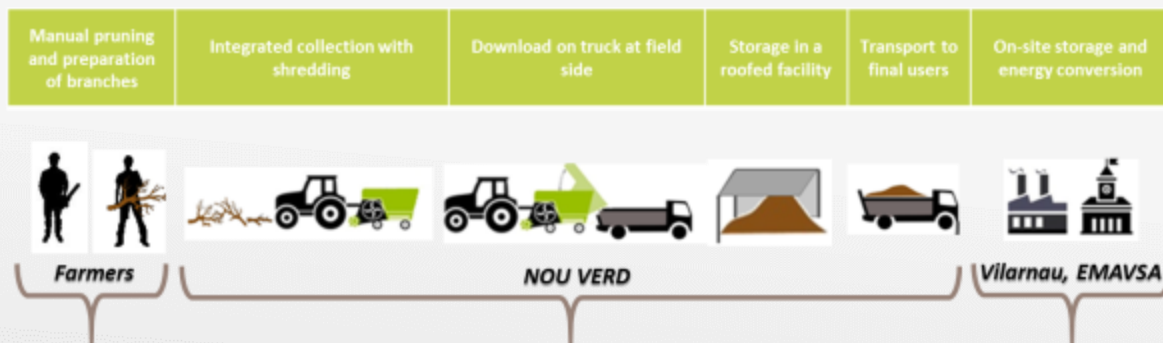


5. Successful value chains – keys for success and real examples

Public-private partnerships - Vineyards4heat

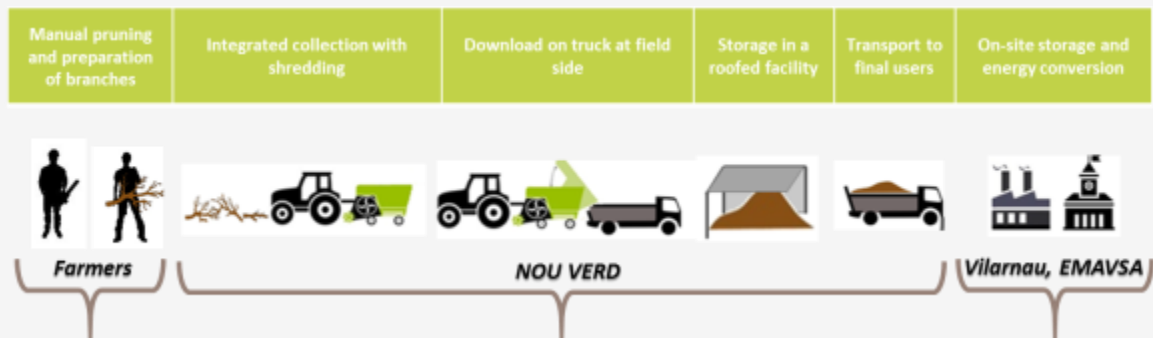
Agro-industrial utilization - ITC Shabo

Power production – Fiusis



Value Chain Actor	Tangible benefits	Intangible benefits
Local farmers	Save time and money in pruning management	Avoid risks of fires and diseases Avoid pollution due to open-field burning of prunings
Social Cooperative (NOU VERD)	Get economic margin Diversify activities	
Cavas Vilarnau	Lower energy cost	“Greener” image of business
EMAVSA (Municipal Water Company of Vilafranca)	Lower energy cost Reduced municipal taxes	Improved air quality Promote successful utilization case of prunings Job creation

- Location: Vilafranca del Penedès, Spain
- Private and Public actors join forces for the production of heat from vine prunings
- Initiated in 2015
- 225 t/y APPR biomass during the project, potential can be up to 30,000 t/y
- APPR sourcing radius: 15 km
- Total investment: 600 k€
- 4 permanent jobs created
- 125 t of CO₂ avoided in 2016



Logistics operations for pruning wood





Success factors:

- Important concentration of local vineyards
- Clear policy objectives and prior research and market analysis
- **Demand ensured by public institutions**
- Campaigns to promote social acceptance
- Local established service companies / persons with capacities to start new biomass chains on prunings
- Costs of pruning management recognized by farmers
- Learning from others' experiences
- Alliance among diverse local key actors
- Careful planning of the logistics and value chain

Future perspectives:

- New end-users (other private companies, more public buildings connected to the DH system)
- Technological development (prototype machine for collection of pre-pruning material)



SINCE  1822
SHABO



- Location: Odessa region, Ukraine
- Use of vineyard prunings for heat production in winery / distillery
- First successful case of industrial APPR use in Ukraine
- Initiated in 2015
- 1,000 – 1,500 t/y APPR consumed
- Sourcing radius: 10 km
- Total investment: Not disclosed. No public funds used
- 5 permanent jobs for boiler house operation
- 7 part time jobs for logistics and 2 part time jobs at storage facilities
- ~ 1,500 tCO_{2eq} avoided per year

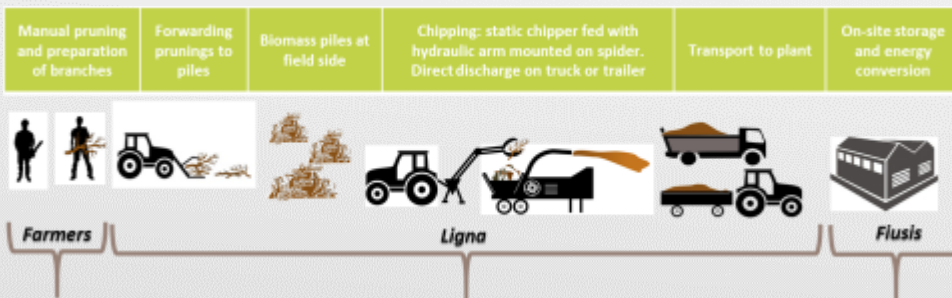
Value Chain Actor	Tangible benefits	Intangible benefits
Farm Cooperative (Agrofirm Shabo)	Save time and money in pruning residues management Small revenue from selling prunings to end-user	Avoid risks of fires Avoid production of smoke and emissions in the area. Good image for local authorities and population.
Biomass consumer (ITC Shabo)	Low cost of biomass Savings in respect to wood or other fossil fuels heating	Diversification of energy sources Increased competitiveness Branding: “sustainability” and “good practices”





Success factors

- Coordinated efforts from value chain actors involved
- Efforts spent on evaluating feasibility and planning prior to starting the initiative
- Increase of fossil fuel prices and limited forest resources in the area
- Solving practical issues as they arose
- Coordinated efforts in logistics and ensuring farmer cooperation
- Learning from experiences of others (e.g. attending exhibitions)



- Location: Calimera, Italy (“Grecia salentina” sub-region)
- First power plant in the world (1 MW_e) fueled exclusively by olive tree prunings
- Initiated in 2010
- 8,000 t/y APPR biomass
- Sourcing radius: 10 km
- Total investment: 8 M€
- 6 permanent jobs created at the energy plant
- 10 permanent and 5 seasonal jobs for the logistics chain
- ~ 5,300 tCO_{2eq} avoided per year

Value Chain Actor	Tangible benefits	Intangible benefits
Farmers	Save time and money in pruning management	Avoid risks of fires Avoid air pollution from uncontrolled burning of prunings
Fiusis power plant & Ligna subsidiary	High feed-in tariff (280 € / MWh _e gross) for electricity production by using local biomass Cheaper sourcing of biomass	“Greener” image of company Closer ties with local community / fewer objections to operation





Success factors:

- Targeted campaigns and actions to ensure social acceptance
- Profitability supported by a high feed-in tariff (28 c€/kWh)
- High biomass productivity (due also to pruning frequency) & high density of local olive groves reduces the transport distance and sourcing radius
- Quick farmer turnover to the pruning supply scheme (cost-savings compared to current pruning management)
- Careful planning and development of suitable and cost-effective logistics arrangements

Future perspectives:

- At least 10 more years of operation ensured through contract with state grid
- New business line → olive tree pruning pellets?
- New business line → ash as fertilizer?



Lessons learned

- APPR value chains can be versatile
 - No “one-size-fits-all” model exists
 - Local conditions and peculiarities should be considered
 - Different products can be produced: heat, electricity, upgraded bioenergy carriers (chips, pellets), even bio-commodities
- Low biomass productivity is not an obstacle
 - Cases where productivity < 1 t/ha
 - Less effect of productivity when displacing fossil fuels for heat applications
 - Power production is more restrained by the level of the feed-in tariff
- APPR value chains are mostly local
 - Typical sourcing radius: 10 – 15 km
 - Involvement of local actors and local acceptance is a prerequisite for success



Lessons learned (continued):

- APPR value chains foster job creation and rural development
 - New, even permanent jobs, created for most models (except self-consumption)
 - Other tangible and intangible benefits also materialize on local level
- APPR value chains constantly evolve
 - Adapting to local and changing market conditions, refining business model and logistics, developing new products is key to success
- Skepticism is to be expected in early stages
 - Initial reaction tends to be negative
 - Snowball effect once benefits become apparent
- APPR utilization starts from a change in farmers' attitude and practices
 - Agreement between farmers and next-in-line actor is critical (given for free, sold for a price, or service paid)
 - Practical demonstration of feasibility of new agronomics

6. Existing methods to collect APPR biomass



APPR is basically wood biomass but...

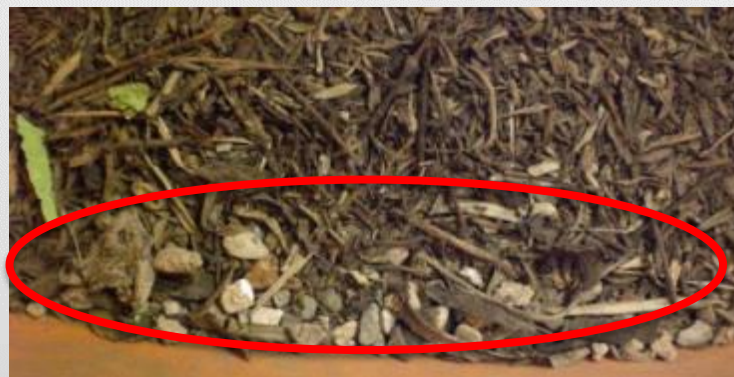
- Territorial dispersion, size and layout of plantations
- Variable productivity depending on numerous parameters (crop, variety, irrigation, agronomic practices, etc.), lower than forest stem wood (> 40 t/ha)
 - Annual pruning: ~ 0.5 to 2.0 t/ha (dry matter) in good conditions
 - Biennial pruning: ~ 2 to 4 t/ha (dry matter)
 - Higher amounts for less frequent pruning operations (e.g. topping, grafting, etc.)
 - Plantation removal: ~ 5 to 10 t/ha (dry matter) or more
- Similar energy to forestry wood ($\text{LHV}_{\text{db}} = 17 - 18 \text{ MJ/kg}$)



APPR is basically wood biomass but...

- Presence of leaves, small branches
- Significant impact of collection practices on ash content
- Higher copper content due to fungicides used (no issue with other minor elements)
- BIOmasud Plus project results: 20 and 16 mg/kg on a fuel dry basis for olive tree and vineyard prunings on average (forest wood chips: 10 mg/kg)
- No major issue in modern systems: non-volatile element, high temperature combustion, “dilution” of copper effect due to high ash content

Solid biofuel	Ash content (% wt, db)
Wood pellets (ENplus A1)	< 0.7
Forestry woodchips (high quality)	~ 1.0
Fruit stemwood woodchips	1-2
Prunings (clean, without leaves)	< 4
Prunings (clean, with leaves)	< 5
Prunings with soil	> 10
Fruit tree with roots	> 20





Why is harvesting important?

Harvesting has direct impact on:

- Final cost (often more than 50 % for prunings)
- Quality → Value





Harvesting pruning wood

Pruning harvesting methods:

1. Hauling branches and shredding/chipping/baling at field side
2. Collection integrated with shredding/chipping/baling
3. Pre-pruning with integrated shredding/chipping

Preparation of prunings may be necessary before the collection step:

1. Leave them as they fall from the tree (more time required during machine operation)
2. Windrows in the center of the tree rows; minimizes tractor operation time, simple to perform, occurs even when mulchers are used
3. Collection of branches in piles (good option when static chippers are employed)



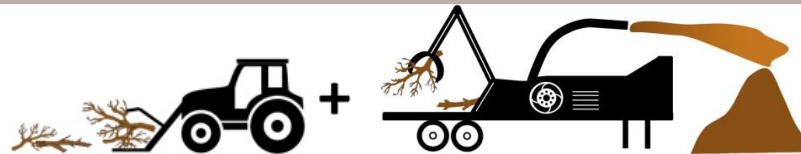
Biomass treated at field side

FORMS TO OBTAIN PRUNING BIOMASS

MANUALLY



HAULAGE +
SHREDDING /
CHIPPING





PRUNING - FORWARDING



- Fast
- Low investment
- But... who can use the APPR Wood with soil and stones?



PRUNING – FIELD SIDE SHREDDING / CHIPPING

Manual chipping

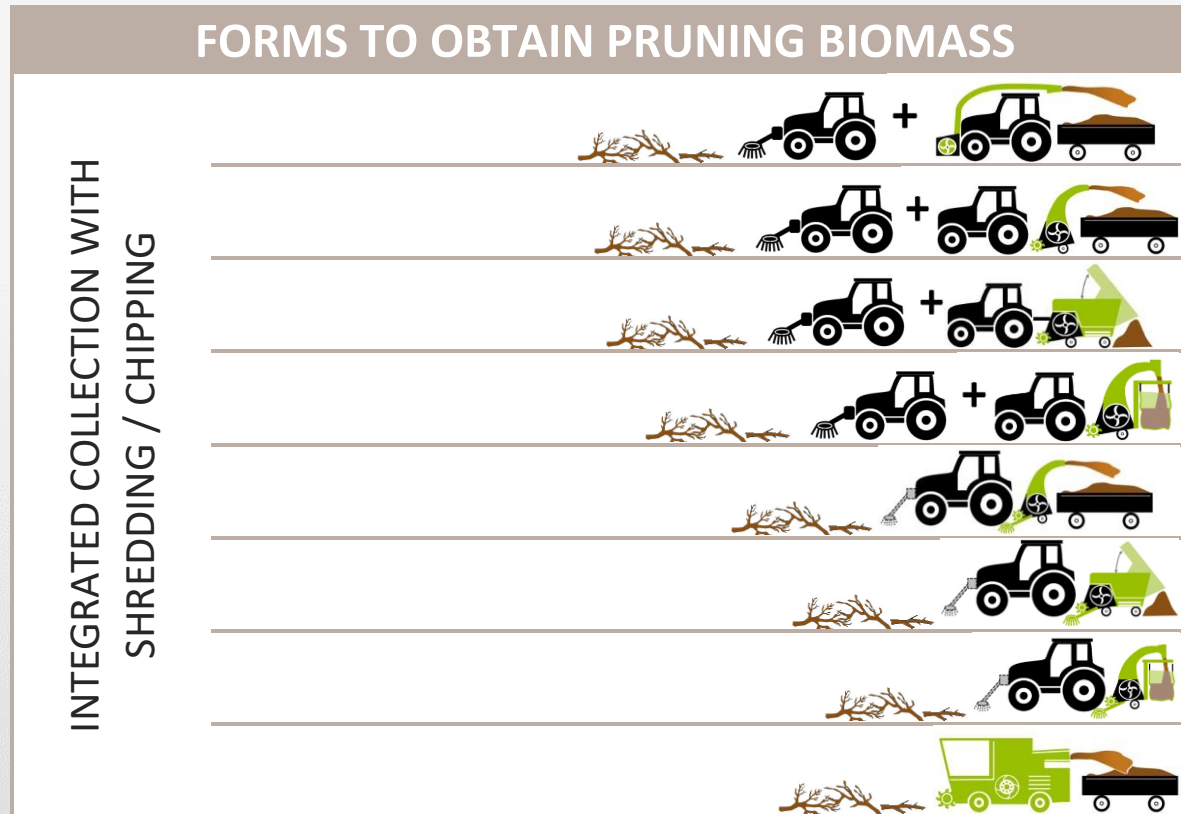


Large shredder





Integrated collection with chipping / shredding





Pruning integrated collection & shredding



Shredder mounted in front with discharge on agric. trailer



Shredder mounted at rear with discharge on agric. trailer



Shredder mounted at rear with discharge on a bin mounted at front lift



Automotive shredder

Multiple systems and solutions in the market



Shredder towed with discharge on big-bags



Shredder towed with discharge on agric. trailer



Shredder towed with built-in dump / tilting container



Shredder towed with built-in tilting container discharging on height



PRUNING FRONT SHREDDERS



Biomass 150 (SERRAT)

Biomasa Natura (PICURSA)

- Usually high power demand
- Usually fine shredded material
- Avoid driving over the branches



PRUNING – Rear shredders

To trailer



PMA 16CR (PROMAGRI)

Into a bin



TRISA BIO (BELAFER)

Into big-bag



TRP (Kuhn)

- Directly derived from mulchers
- Irregular material
- More economic. Robust in general.
- Multiple models (mainly Italian and Spanish)



Pruning integrated collection & chipping



Chipper mounted in front



Chipper towed with discharge on big-bags



Chipper towed with discharge on agric. trailer



Chipper towed with built-in tilting container discharging on height

Few systems and solutions
in the market



PRUNING– Rear **CHIPPERS**



**Marev Alba (Costruzioni
Nazzareno)**



**EuroPruning - PC50 (ONG-
SNC)**

- Not shredding, but **chipping**
- Only 4 models in market (3 German and 1 Italian)
- More homogeneous. But not like forestry woodchips
- Weaker than shredders; higher maintenance



Pruning integrated collection & baling



Pruning
baler (small round
bales) with
integrated storage



Hay round baler
utilized for pruning
baling



Hay square baler
utilized for pruning
baling



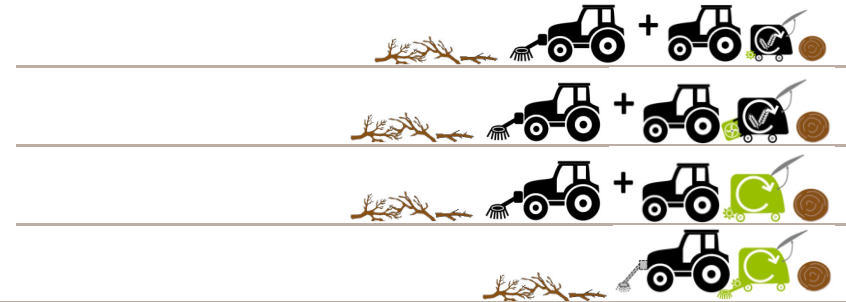
Pruning
round baler



Pruning
square baler

FORMS TO OBTAIN PRUNING BIOMASS

INTEGRATED
COLLECTION WITH
BALING





PRUNING – Bales



QuickPower (Caeb)



**EuroPruning - PRB1,75
(PIMR)**

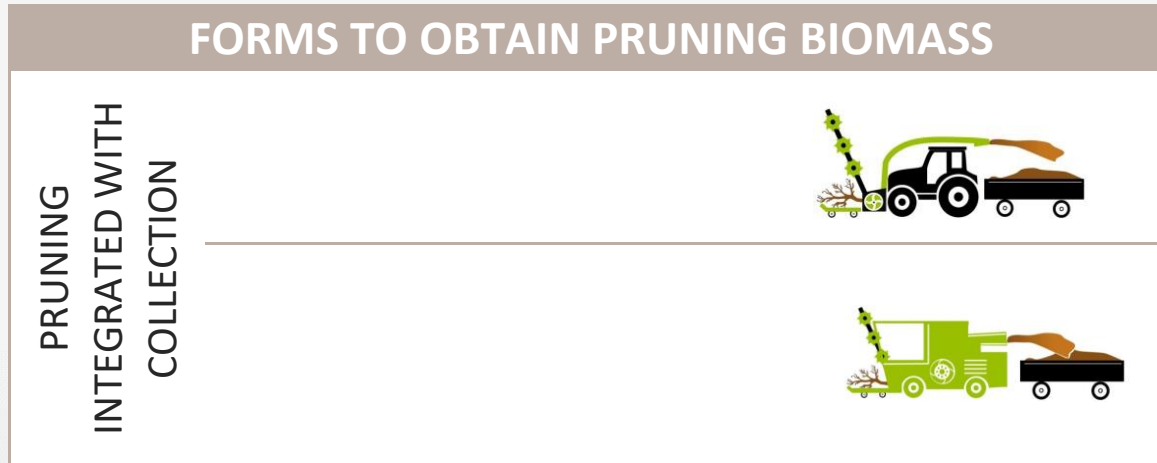


**SERRAT T2400 header mounted on a
CLASS straw baler to collect and crush
tree prunings**

- Need to drive over pruning wood
- Restrictions on pruning diameter and length
- Bale densities under 200 kg/m³ in round bales
- After baling you need to recollect the bales (on field) and chip (at consumer)



Pruning operation integrated with collection and treatment



1 system in market, and 1 prototype



PRUNING – Integrated pruning and collection



Speedy-cut (FAVARETTO)



Prototype developed in the project Vineyards4Heat

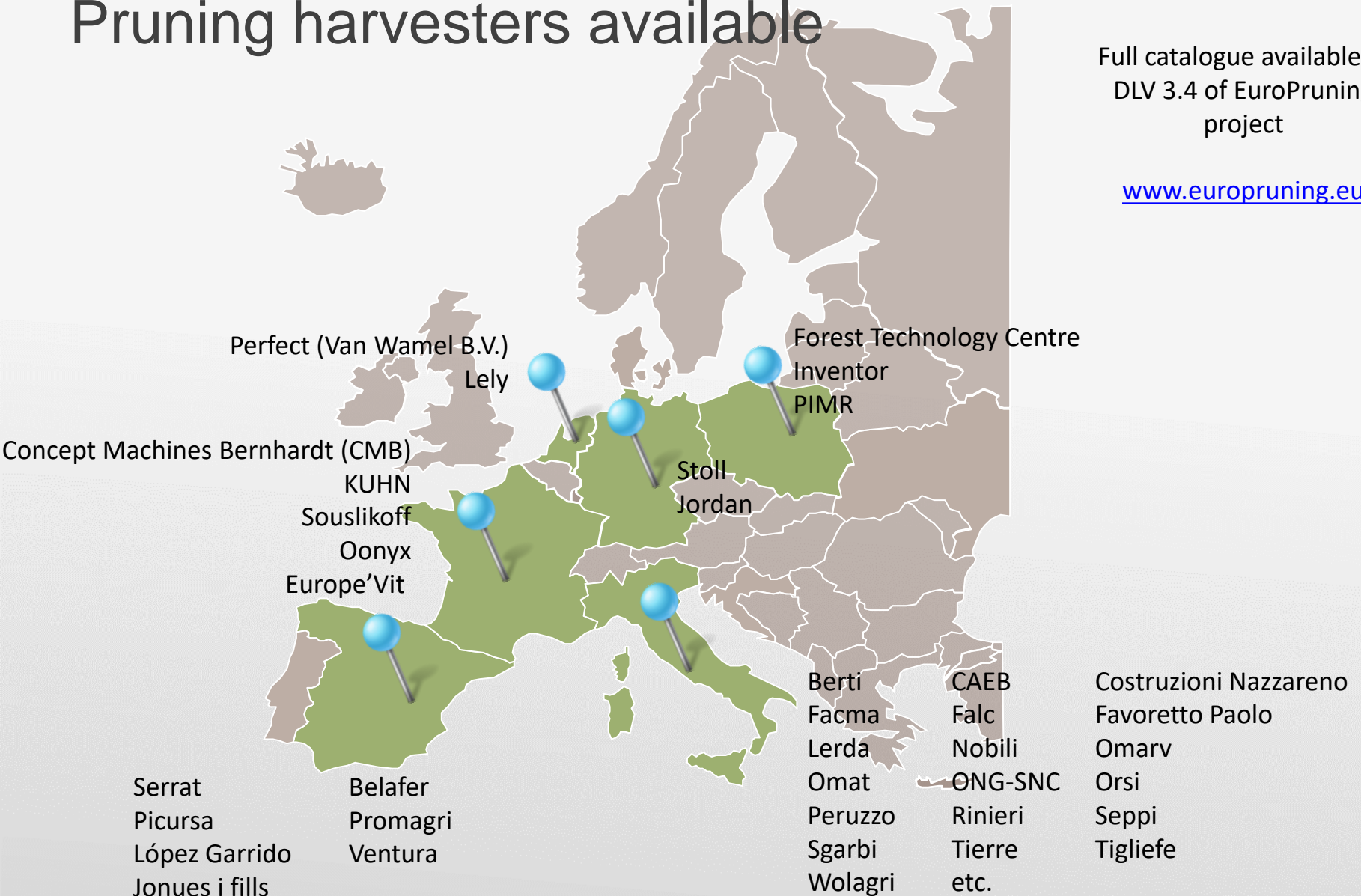
- In development
- Reduce costs
- Key for intensified crops with mechanical pruning (e.g. vineyard)



Pruning harvesters available

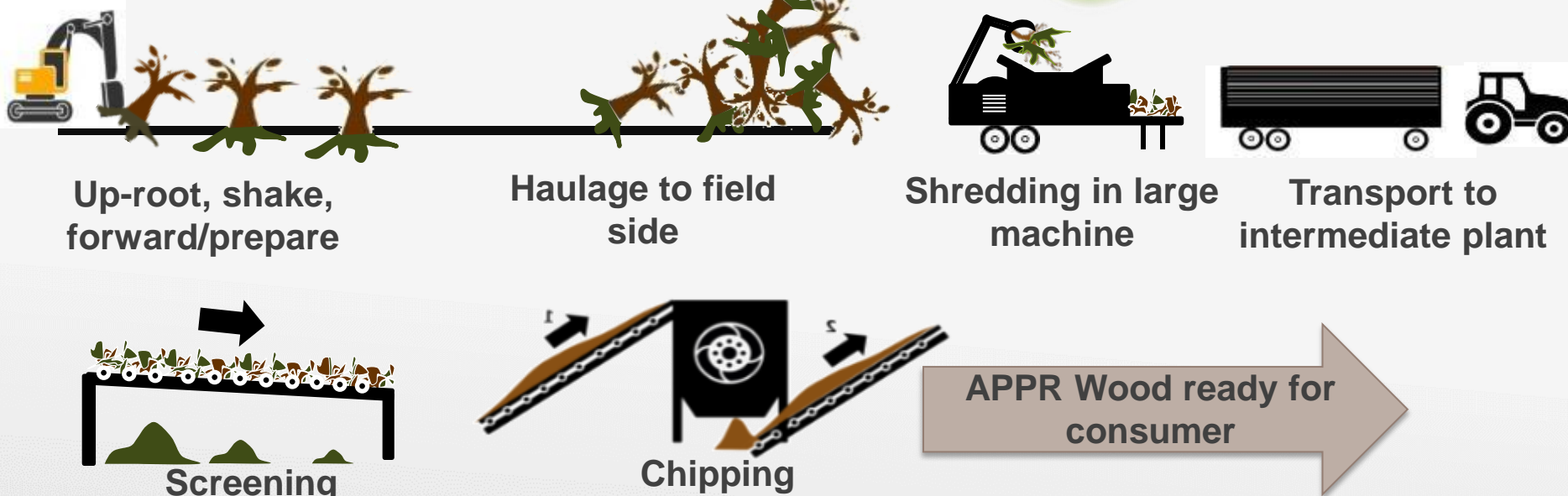
Full catalogue available in
DLV 3.4 of EuroPruning
project

www.europruning.eu





PLANTATION REMOVAL wood



- Large shredders/chippers can cost 300.000 to 500.000 €
- Biomass produced still has stones and soil. Not so goo, so the price may be lower in comparison to forest woodchips

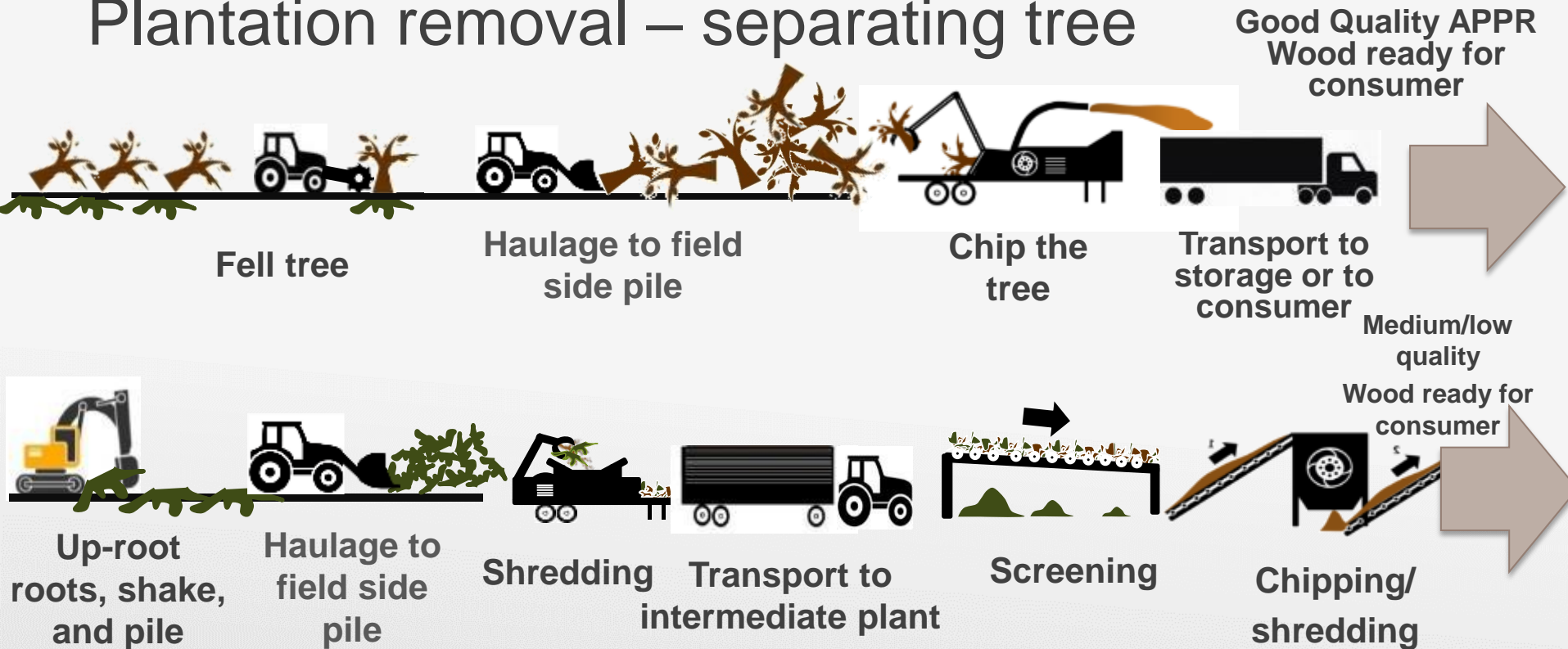


PLANTATION REMOVAL wood





Plantation removal – separating tree



- Also requires high investment
- Produce woodchips of 2 different qualities



Plantation removal – separating tree

Felling



uP_running demo in Spain (Dez. 2017).
Gruyser - Ecoadeso



Up-rooting stumps

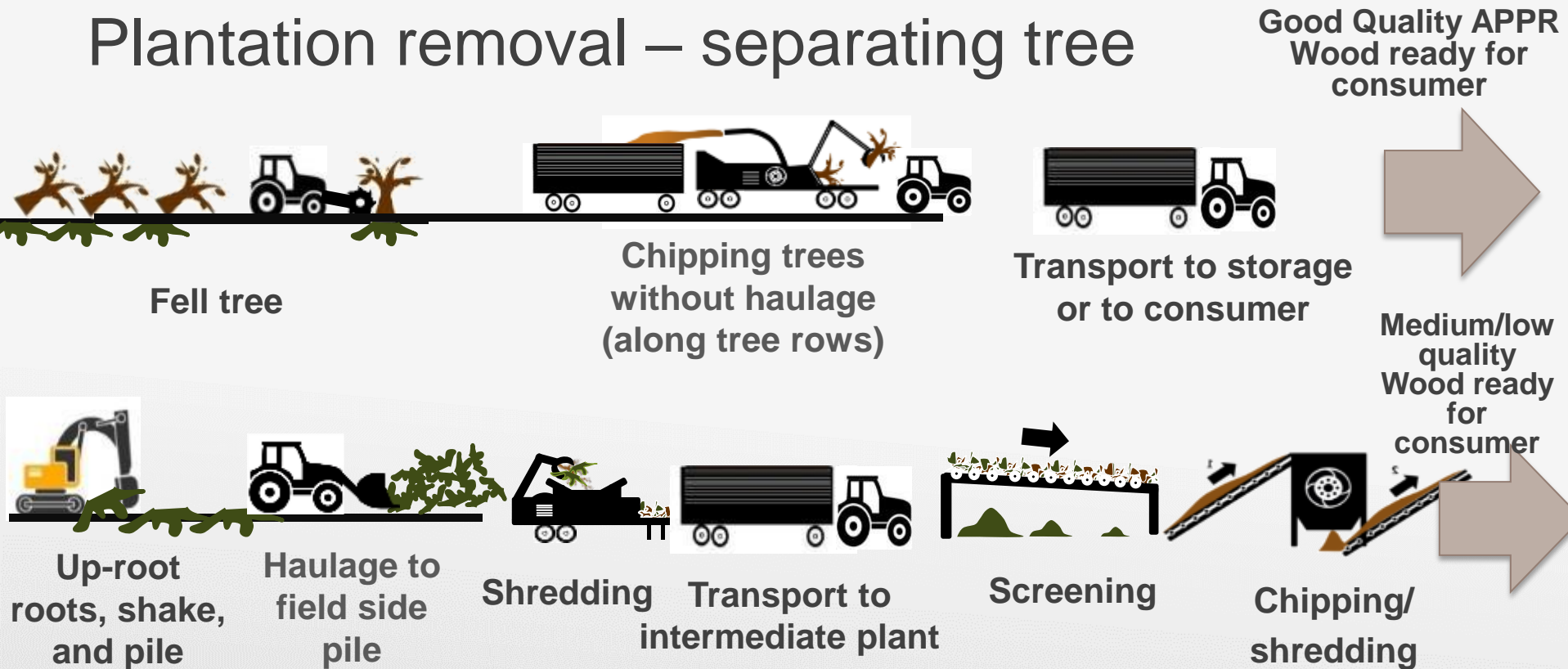


Shredding trees





Plantation removal – separating tree



- No haulage: Avoid contamination with soil particles of the tree wood
- Also requires high investment
- Produce woodchips of 2 different qualities

Plantation removal – separating tree

Felling (like previous case)



Stumps



Downloading (field-side)





Many methods available, no “perfect” machine exists

- Use proven technology
- Choose machines based on local conditions
 - Perform initial tests; consider variability and measures to increase performance
 - Take into account downstream operations
- Preventive maintenance and appropriate
- Involve farmers in the discussion
 - Agree upon maximum losses
- Select the operation mode having in mind the quality required
- Compare costs between improved field operations vs. simple and low cost operations and additional secondary processing
- Avoid working during and after rains

7. Pruning to energy: on the importance of quality



uP_running: Woody biomass fromagrarian pruning and plantation removal (APPR)

- Similar energy than forestry wood
- More irregular, usual higher ash content

As good as fuel as forest woodchips ...



≈



$LHV_{db} = 17 - 18 \text{ MJ/kg} \approx LHV_{db} = 18 \text{ MJ/kg}$

LHVdb: low heating value in dry basis





APPR Biomass: not everything is OK...

APPR firewood



Shredded olive pruning



Biomass quality defines its price

Heating value of APPR wood

	Stem Wood (pine)	APPR wood	Olive pits	Almond shells
Dry basis (MJ/kg)	18,5-19,8	17,5-18,5	17,3-19,3	17,5-19,0





Biomass quality defines its price

QUALITY → To satisfy needs of consumer

- MOISTURE
- PARTICLE SIZE
- ASH CONTENT



Moisture affects price

Valoriza Energía
Operación y Mantenimiento

BIOMASAS DE PUENTE GENIL, S.L (9,7 MW)
Ctra. Puente Genil-Santaella (A-379), Km. 25
14500 Puente Genil (Córdoba)

Valoriza Energía
Operación y Mantenimiento

BIOELÉCTRICA DE LINARES, S.L (15 MW)
Ctra. Nacional 322, km. 126
23700 Linares (Jaén)

AGRICULTOR,
AHORRE 30-40 €/ha
DESTINANDO SU PODA DE OLIVAR A
BIOMASA CON FINES ENERGÉTICOS
Central de compras: 957 028202 / 616 810 454
Delegación Linares: 616 584 744



Moisture affects price

VALORIZA ENERGÍA O&M es la empresa del **GRUPO SACYR** dedicada a explotar plantas de energía renovable entre las que se encuentran dos plantas de generación eléctrica mediante la combustión de biomasa.

BIOMASAS DE PUENTE GENIL de 3,7 MW. BIOELÉCTRICA DE LINARES de 15 MW.

Actualmente dichas plantas consumen 220.000 toneladas de biomasa, principalmente orujillo y restos de poda de olivar y frutales.

La biomasa triturada la recibimos en planta directamente de agricultores bien a través de algunos nuestros suministradores.

Destinando los restos de poda a generación eléctrica se reducen considerablemente los costes de eliminación de este residuo que alcanza un coste medio de 50 €/tna y se colabora con el medioambiente evitando que se quemé.

El mayor o menor ahorro dependerá principalmente de la distancia de la finca a nuestras plantas, puesto que el coste del transporte supone gran parte del coste de la biomasa.

Precio poda olivo y frutal pretriturado

Granulometría	€/Tn
10	37,24
11	36,70
12	36,16
13	35,62
14	35,08
15	34,54
16	34,00
17	33,46
18	32,92
19	32,38
20	31,84
21	31,30
22	30,76
23	30,22
24	29,68
25	29,14
26	28,60
27	28,06
28	27,52
29	26,98
30	26,44
31	25,90
32	25,36
33	24,82
34	24,28
35	23,74

Precio poda olivo y frutal pretriturado	
Granulometría	Máximo 5 cm de diámetro y 50 de longitud.
% HUMEDAD	€/Tn
10	37,24
11	36,70
12	36,16
13	35,62
14	35,08
15	34,54
16	34,00
17	33,46
18	32,92
19	32,38
20	31,84
21	31,30
22	30,76
23	30,22
24	29,68
25	29,14
26	28,60
27	28,06
28	27,52
29	26,98
30	26,44
31	25,90
32	25,36
33	24,82
34	24,28
35	23,74

Particle size

PRUNING: Size and shape of the particles



Pruning woodchips
(clean cut)

Thick shredding
(break with hammers)

Fine shredding
(fine defibered)



Particle size

PLANTATION REMOVAL: size and shape of the particles



With dry wood



With fresh wood



**Fruit tree
woodchips**

(clan cut, forestry chipper)

Shredding

(high velocity)

Crusher

(large/inhomogeneous)



Particle size

Be careful with homogeneity. LARGE
PIECES? TOO MANY FINES?



May need a screening? → 5 to 10 €/t

PARTICLE SIZE

Problems in feeding boilers



Clogging in screw feeder



Bridges inside the hoppers

Ash content

- Pellet EN-PLUS: < 1% (db)
- Forestry woodchips high quality: 1 % (db)
- Fruit Stemwood woodchips: 1-2 % (db)
- Pruning (clean, without leaves) < 4 % (db)
- Pruning (clean, with leaves) < 5 % (db)

What if we “collect soil and stones?”...

Pruning with soil.... Ash > 10%

Fruit tree with roots... Ash > 20%





Biomass quality defines its price

- **Be careful with soil and stones incorporation!!!!!!**

- Key points during recollection:

- Better to collect on a soil with green cover
- Machinery: avoid “scratching” the soil (raise the rake)
- Avoid recollection when raining or when soil is wet

- Key points during handling and storage:

- Put always your biomass on paved soil
- Use clean trucks and trailers (no truck trash!)





Maintaining product quality: it's everyone job!

- Physical form of APPR
 - Bulk biomass: reduced handling costs for larger scale operations
 - Big bags: only for self-consumption
 - Bales: long term storage and/or consumption in bale boilers
- Promote discharge of biomass bins directly on containers or trailers or paved soils to reduce handling time, losses and contamination
- Storage considerations:
 - Before collection: natural drying at field side / field soil
 - Hof fuel increases degradation. Previous moisture reduction or frequent aeration
 - Ideal storage: under cover, without walls
 - In open air, prepare larger piles
- Avoid contaminations during transport
- Fuel mixing
 - Can improve quality
 - However, avoid demolition wood, chemically treated wood, *etc.*

8. Conclusions – General remarks and lessons learned



General remarks and lessons learned

- APPR biomass is possible. Many existing VCs.
- Profit margin tight → avoid many operations, be efficient.
- APPR value → avoid soil / stones and fermentation in piles.
- Harvesting is a critical stage → influences quality and more than 50% of total cost.
- All VCAs should find a benefit → Select the appropriate model.
Money transactions may be necessary (e.g. a farmer paying for a service of pruning collection).
- Intangible value can make the difference.



Take-off for sustainable supply of woody biomass from
agrarian pruning and plantation removal

Thank you very much for your attention!



Take-off for sustainable supply of woody biomass from
agrarian pruning and plantation removal

Methodology for consultancy

Training Session 2

Call H2020-LCE-2015-3
Coordination and support action

June 2018/UCAB



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Training Session 2. Content

1. What is consultancy and who is the consultant?
2. Why a consultancy is necessary for new entrepreneurs of APPR biomass?
3. Aims of the consultancy and role of the consultant
4. Specific approaches in consultancy on APPR biomass using for energy
5. Methodology of Consultancy and materials to be used
 - 5.1. PHASE I. Initial identification and early information
 - 5.2. PHASE II. First field visit
 - 5.3. PHASE III. Analyze and supplement of information
 - 5.4. PHASE IV. Transfer results
6. Conclusions and recommendations

1. What is consultancy and who is the consultant?



What is Consultancy? Who is the Consultant?

Consultancy is defined as the provision of expert advice analysis and interpretation, which draws upon and applies the expertise and knowledge on certain problem.

A **consultant** (from Latin: consultare "to deliberate") is a professional who provides expert advice in a particular area....

... in our case – in **using APPR biomass for energy!**

A consultant is usually an expert or an experienced professional in a specific field who has a wide knowledge of the subject matter.



2. Why a consultancy is necessary for new entrepreneurs of APPR biomass?



Why a consultancy is necessary for new entrepreneurs of APPR biomass?

1. Non-technical barriers are, in most of the cases, the reason for a scarce utilization of wood from APPR in Europe
2. Entrepreneurs usually have neither examples (models) nextby to replicate, nor wise advisor (consultant) to solve their doubts or questions about APPR biomass.

uP_running partners have the knowledge and experience => they are ready to share it with YOU!

After this training you will be able

- to give valuable support for farmers, cooperatives or other companies that are interested in starting new value chains based on this type of biomass.
- to answer some of their questions, give examples of success cases, put them in contact with other stakeholders, etc.



3. Aims of the consultancy and role of the consultant



Aims of consultancy

Consultancy is to support the entrepreneur in solving doubts:

- visualizing how so coherent is what he is thinking,
- avoiding early death-track models (leading to failure of initiatives),
- highlight next needed steps, etc.

Entrepreneur should

- gain knowledge,
- understand better the business,
- obtain a series of items for the final decision making
(biomass productivity, harvesting methods, quality issues, etc.).

! Your role is

- to listen and understand what the business idea is
- to provide ideas, facilitate examples, counsel and put in contact with potential partners (e.g., machinery providers or potential consumers).





and role of a consultant

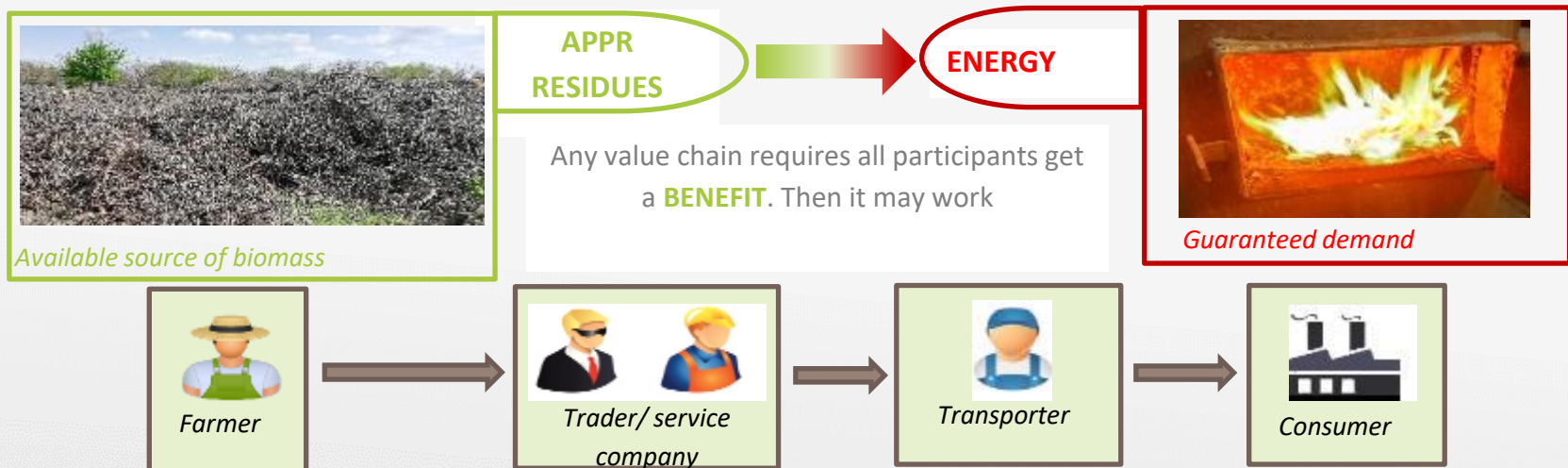
The role of the consultant is first to listen and understand what the business idea is and, secondly, to provide ideas, facilitate examples, counsel and put in contact with potential partners (e.g., machinery providers or potential consumers).



4. Specific approaches in consultancy on APPR biomass using for energy



Specific approaches in consultancy on APPR biomass using for energy



CONSULTANT must find answers on questions:

- How much APPR biomass is formed, what types and when?
- What quality of APPR biofuel can be obtained and what is its price on the market?
- What model of use APP biomass for energy is rational for initial conditions?
- What actors can be in the APPR biomass value chain?
- Who can be a PrMov (Consumer, Transporter, etc.)?
- What operations can be in the APPR biomass value chain?
- etc.



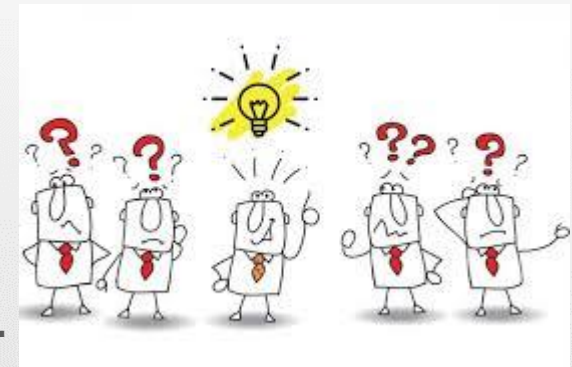


Find a “prime mover”

An APPR value chain may involve several kinds of actors, BUT it is usually initiated by one “**prime mover**” (PrMov)

- the most active actor in the value chain,
- who engages the others and makes things happen,
- the one that takes the most risk from the involvement in an APPR value chain.

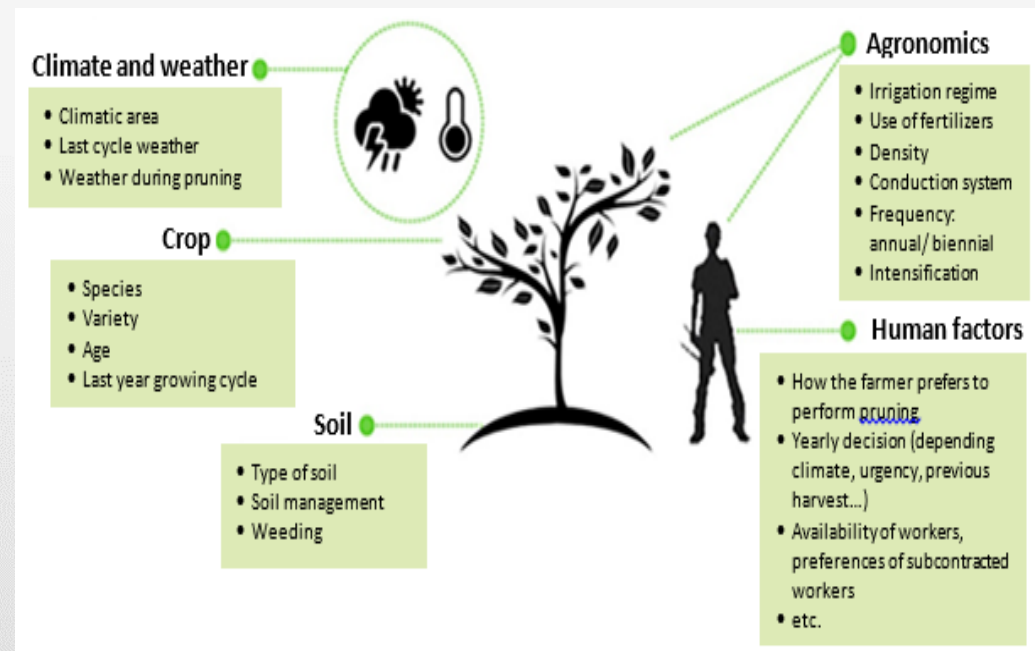
The proper acknowledge of this entity is important,
both on the grounds of ethics,
but also to understand why and how an initiative took place.



Main factors to estimate APPR value chain

Other important general information for an APPR value chain:

- type of APPR biomass involved (prunings, plantation removal or both)
- the crop species used
- start date of the value chain
(as an indicator of its maturity)
- volume of APPR biomass mobilized annually
(as an indicator of its size).





Consultants' specific for APPR

YOU should be “open-minded” and creative

- to find solutions under different initial conditions,
- various interests of the stakeholders,
- different models of use APPR biomass for energy (self-consumption, biomass to market, power production, etc.)

YOU should be ready

- to identify APPR biomass value chain actors and Prime Movers,
- to set up direct contacts and meetings with different peoples,
- to find successful decisions or solutions.

TAKE INTO ACCOUNT: regional specific, different types and amount of APPR biomass; local biomass market features; different key actors and stakeholders; different machines and equipment; sustainable development approaches and economic feasibility.





Needs of a client

Each entrepreneur has a different set of needs, for example:

- Some may require some knowledge transfer and recommendations (e.g., biomass quality issues).
- Some other just do not know how to organize the info to have a clear scope of what decision make.
- Some need to understand better and keys from existing value chains
- Some may need help to draft their business plan.
- Some others lack of the key actors necessary to start new APPR initiative.

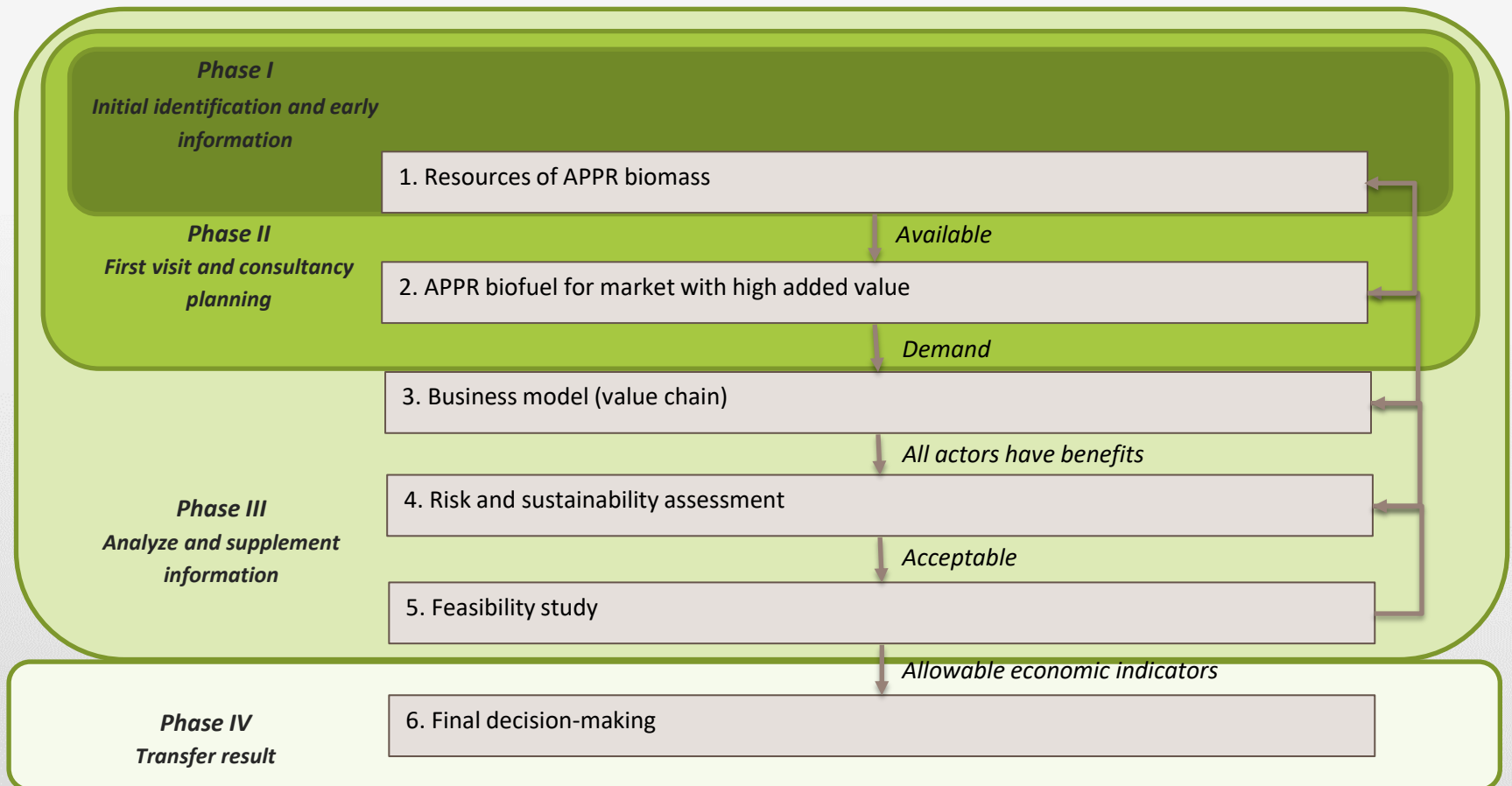


5. Methodology of Consultancy and materials to be used:

Main phases and stages of implementing a new value chain



Phases and stages to implement a new value chain based on APPR biomass



5.1. PHASE I

Initial identification & early
information



PHASE I: Initial identification & early information

OBJECTIVE

To find the potential entrepreneurs and get preliminary information about their proposed initiative.

In that sense, a first assessment of the APPR biomass potential may be performed based on the amount of hectare of APPR biomass in this area and on the first round of the contacts with producers of APPR biomass.

Also, it is important to determine the current use of the pruning and plantation removal by the farmers (e.g. mulching on soil, open-air burning, etc.).





PHASE I: Initial identification & early information

HOW TO PROCEED?

1. Find a list of stakeholders with contact information from the local farmer associations, data basis, municipality, business association, etc. to make the **first round** of phone callings or emails
=> you will be able to identify the stakeholders for APPR biomass value chains.
2. Group together the stakeholders that are located in a same province/zone, identify who can band together to form a larger volume of APPR biomass, cooperate for buying machinery, etc.
3. Identify if he/she is really interested in starting a new value chain, or participating in a new or existing one, which is its necessities and interests, needs for the setting-up of this new chain, main weaknesses, etc.
4. Make the **second round** of contacts and meetings, including the first visit to the most promising entrepreneurs, so as to engage them and offer formally the consultancy service.
5. **! It is strongly recommended** that those entrepreneurs who do not show a real interest in the consultancy services are discarded in an earlier stage.
6. Estimate the potential of APPR biomass of that area of study (a radius of 20, 40 and 60 km), in order to determinate the kind of APPR biomass and the approximate surface.
7. **Ask for the TP support if needed!**



PHASE I: Initial identification & early information

OUTPUT

- List of the potential APPR biomass VC actors who are interesting in receiving consultancy services.
- Selection of the entrepreneur(s) that will receive consultancy.
- Preliminary assessment of APPR biomass potential for these stakeholders.



Recommendations

First round of the contacts with APPR biomass producers => use the **templates for assessment of APPR biomass potential** (Annex I of the Handbook) to collect necessary data.

Second round of contacts and meetings => revise the assessment of APPR biomass potential by taking a new and more accurate data.

Related materials you can find in the Handbook:

Material	Short Description
ANNEX I “Template for APPR biomass potential assessment”	If the entrepreneur is APPR producer (e.g. farmer or cooperative), this template will be helpful to collect and register data related to the APPR resources

5.2. PHASE 2

First visit and consultancy planning



PHASE II. First visit and consultancy planning

OBJECTIVE

The main objective of the first visit is to explore deeper the initiative that is proposed (i.e., which type of APPR biomass, which actors and potential business model, which types of costs, etc.) and to discuss what are the main needs and priorities of the entrepreneur.

Finally, engagement of both the consultant and the entrepreneur is made through a “commitment letter”, where consultancy activities are listed.

Important

Before the visit collect as much information as possible about

- the PrMov
- the stakeholders/actors
- the region
- the market

PHASE II. First visit and consultancy planning

Practical steps

1. Present yourself and the project as well as purpose of this visit.
2. Listen to the entrepreneur and ask the right questions, so as to understand the initiative and the model:



- Has the entrepreneur tried to collect or use APPR biomass in the past?
 - Why does he/she is interested in using APPR biomass for energy?
 - Does he/she know existing value chains in the region/country?
 - What are the difficulties he/she is foreseeing?
 - Who are the potential allies or partners for setting-up the chain?
3. Present the type of services/activities you may offer to the entrepreneurs (keep in mind the needs and gaps of the initiative).

Note: AP will accompany the consultant for the first visit, TP will be at the reach of the consultant for solving any questions or doubts.



PHASE II. First visit and consultancy planning

Outputs

At the end of Phase II, the consultant should have a clear idea about:

- Main needs of the entrepreneur
- Type of initiative/model to be implemented
- Weaknesses and gaps of the initiative
- Type of supported activities and schedule for next steps





Recommendations

Important for the consultant to have a look at the data to be collected during the first visit => use **Part 1 of the Consistency Check (Annex V)** to list the different items to be checked regarding the organization of the value chain.

In addition, the **templates for assessment of APPR biomass potential (Annex I)** and **for local biomass market (Annex II)** will help the consultant to ask the necessary information in case the entrepreneur is an APPR producer (Annex I) or in case he/she is a biomass consumer (Annex II).

Recommendations (continuing)

Entrepreneurs are different => choose proper contact strategy!

According to the information to be transferred, you can

- send an initial email with Presentation letter,
- make a phone call to discuss and prepared the meeting,
- make a half day work meeting to present services and gather data, and subsequent phone calls or emails to retrieve the remaining data.



Be sure that the person from prime movers who is actually able to take the decisions (company manager/director or similar) is present in the meeting. Technical staff does not take general decisions!

The best option is to invite both profiles at the meeting so that both management and technical issues may be discussed and solved.

Note: all objectives and information cannot be achieved in a sole meeting.

After the first visit analyze the collected information and supplement missing or disputed information. To collect information about visit/meeting participants => use the

attendance sheet (Annex VIII)



PHASE II. First visit and consultancy planning

Related materials you can find in the Handbook:

Material	Short Description
ANNEX I “Template for APPR biomass potential assessment”	If the entrepreneur is APPR producer (e.g. farmer or cooperative), this template will be helpful to collect and register data related to the APPR resources
ANNEX II “Template for local biomass market”	If the entrepreneur can be a consumer of APPR biomass, this template will be helpful to get information about the local biomass market and find out the possible price of APPR biomass
ANNEX V “Consistency check template” Part 1, “APPR utilization model”	It presents the different forms to organise a value chain and, for each, the items to be checked in order to assess the consistency of the initiative
ANNEX VIII “Attendance sheet”	This sheet will be helpful to collect information about visit/meeting participants

5.3. PHASE III.

Analysis and supplement of
information



PHASE III. Analysis and supplement of information

Main objective

of the third Phase consists in

- analyzing the information gathered previously,
- providing documentation to the entrepreneur,
- solving the main doubts or questions of the entrepreneur has regarding a possible value chain implementation (or participation).





PHASE III. Analysis and supplement of information

It may include different important steps:

1. Field data gathering
2. APPR biomass quality and market value
3. Development of APPR biomass value chain
4. Risk assessment of APPR biomass project
5. Identifying next steps for APPR biomass project development

Number of steps depends on the needs identified in previous activities and the supported actions agreed with the entrepreneur.

Five presented activities are mainly demanded by entrepreneurs who are eager to start an APPR initiative.



PHASE III. Analysis and supplement of information

In the Handbook we present a non-exhaustive list of activities mainly demanded by entrepreneurs eager to start an APPR initiative, SO you may directly read the section(s) of interest, in the view of the type of questions you have to solve:

- ***How much APPR biomass do I have?*** => 3.3.1 Field data gathering
- ***What is the quality of my biomass? What is its value?*** => 3.3.2 APPR biomass quality and market value
- ***Which operations would be needed to mobilize and use to energy the APPR biomass?*** => 3.3.3.1 Value chain operations
- ***Which type of actors can participate in the APPR biomass value chain?*** => 3.3.3.2 Value chain actors
- ***Which are the potential risks of the initiative?*** => 3.3.4 Risk assessment of APPR biomass project
- ***How many CO₂ do I save thanks to my APPR initiative? Can I use residues from prunings or should I let them on soil?*** => 3.3.5.1 Sustainability assessment
- ***Is the initiative feasible? What is the payback period for the new investment?*** => 3.3.5.2 Feasibility study

Step 1: Field data gathering

Very often APPR biomass producers do not know how much biomass they can take from their plantations.

=> organize field measurement in stakeholders' plantations.

Results of the measurements (amount of prunings/plantation removed, in t/ha) write in the **Template for the field sampling of prunings or plantation removal respectively**

Many examples of field measurements can be found on the observatory map of biomass from agrarian pruning and plantation removal. Observatory website at: www.up-running-observatory.eu



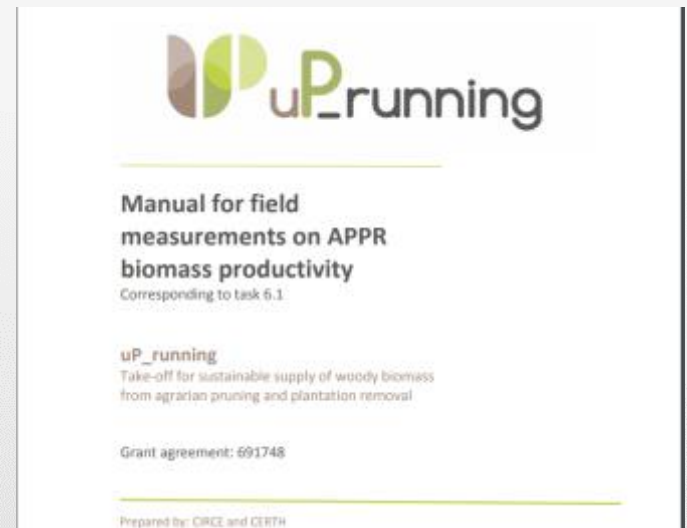
Step 1: Field data gathering

The guidelines “Manual for field measurements on APPR biomass productivity” provides detailed information how to perform measurements of the wood produced per hectare in vineyards, olive and fruit plantations (biomass productivity or biomass yield or biomass potential).

Consultant can choose out of the following three options for the field measurement:

1. Weight of biomass by tree;
2. Weight of biomass in parcels;
3. Weight of biomass in the whole field or along several rows.

The methods are valid for both pruning and plantation removal wood.





Estimated time for 2 persons performing the weighting of biomass in a fruit tree plantation

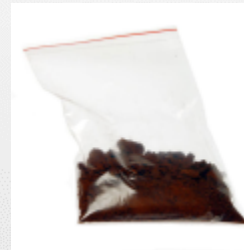
Important! Take into account external circumstances, required time and necessary materials.

Weighting and estimated time for measurement						
	Pruning (annual)		Pruning (structural)		Plantation removal	
	biomass	time	biomass	time	biomass	time
Option 1 – by tree	2-5 kg/tree	<10 min (manual)	5-10 kg/tree	<20 min (manual)	50-100 kg/tree	<40 min (manual)
Option 2 – by parcel (100 m²)	20-50 kg/parcel	<30 min (manual)	50-100 kg/parcel	<60 min (manual)	50-100 kg/parcel	<120 min (manual)
Option 3 – large area (1000 m²)	200-500 kg/field	<15 min (mechanised) + 30 min (losses)	500-1000 kg/field	<20 min (mechanise d) + 30 min (losses)	500-1000 kg/field	200 min + 60 min losses

Moisture of APPR biomass

Carry out a measurement of biomass moisture content and to put the results in the **Template for field sampling of prunings or uprooting material**. Here are some suggestions for the moisture content measuring:

- Moisture meters – insert them into a pile of woodchips.
- Check if the device is compatible and is calibrated with the type of biomass being measured.
- Samples for laboratory: place them in sealed containers or bags (like the zip plastic bags) to ensure there is no loss of moisture until the samples are analyzed.
- No moisture samples are taken and no moisture meter measurements are done – ask the farmer how long the branches were on the soil.
- The field data will be useful to complete **the template for assessment of APPR biomass potential (Annex I)**.





Related materials you can find in the Handbook:

Material	Short Description
ANNEX I “Template for APPR biomass potential assessment”	If the entrepreneur is APPR producer (e.g. farmer or cooperative), this template will be helpful to collect and register data related to the APPR resources
Manual for field measurements on APPR biomass productivity	The detailed information about each step of field measurements on APPR biomass productivity is given in the manual Available at: http://www.up-running-observatory.eu/file_uploads/8_en_uP_running_guidelines_for_field_sampling_EN.pdf
Template for Field Sampling of Prunings	This questionnaire will help to take data for field sampling prunings Available at: http://www.up-running-observatory.eu/file_uploads/2_en_Template_for_Field_Sampling_of_Prunings.pdf
Template for Mechanized Collection of Plantation Removal	This questionnaire will help to take data for field sampling plantation removal Available at: http://www.up-running-observatory.eu/file_uploads/3_en_Template_for_Field_Sampling_of_Plantation_Removal.pdf



Step 2: APPR biomass quality and market value

APPR biomass quality and its market value important for value chain.

Important!

Technical steps adopted for the logistics operation impact on fuel specifications of APPR biomass prior to energy conversion.

To systematize received information => use the **template for local biomass market (Annex II)**

The following parameters are considered for describing this aspect of a value chain:

1. The form of APPR biomass prior to exploitation: bales of branches, wood chips, hog (or shredded fuel), pellets and other types.
2. The maximum moisture content (% as received).
3. The maximum ash content (% dry basis).
4. The minimum low heating value (kJ/kg as received).



APPR biomass vs woody biomass

In general, APPR from the vineyard, olive groves, and fruit trees are a woody biomass with good energy content, but with some particular differences when it is compared with forest biomass (Table below).

Characteristics of different types of APPR biomass after mechanical collection (by harvesting with integrated shredder) and processing

Combustible	Pine chips Class B EN-ISO 17225	Almond pruning	Peach tree pruning	Olive pruning	Vineyard pruning
Water (% wt, ar)	≤ 35.0	34.4	37.5	27.6	41.5
Ash (% wt, db)	≤ 3.0	4.6	3.7	4.8	3.5
LHV (MJ/kg, ar)	-	10.6	10.5	12.5	9.2
LHV (MJ/kg,db)	18.2	17.4	18.3	18.2	17.4

Note: ar: as received. db: dry base

APPR quality assessment

To assess APPR biomass quality => use the **uP_running Observatory tool**
<http://www.up-running-observatory.eu>

To determine more precise data => take samples of biomass from a field and make an assessment of its quality using **Guidelines on “Biomass Quality and Market Value”** developed by uP_running project.

- The main output of the consultancy is the possible price that final consumers can pay for such biomass.
- Defining of a high added value form of APPR biomass is the key factor of the value chain success.

Observatory map of biomass from agrarian pruning and plantation removal





Related materials you can find in the Handbook:

Material	Short Description
ANNEX II “Template for local biomass market”	If the entrepreneur can be a consumer of APPR biomass, this template will be helpful to get information about the local biomass market and find out the possible price of APPR biomass
Guidelines “Biomass Quality and Market Value”	This document presents the guidelines to assess the quality of the biomass produced through the <i>uP_running</i> demos execution, as well as the value it may reach from the point of view of potential end-users
Monograph “Biomass from agricultural pruning and plantation removals: a feasible practice promoted by <i>uP_running</i> ”	This monograph provides an insight into the current status of use of APPR biomass, its difficulties, the possible alternatives to organize a value chain, and some practical recommendations to do it. Still two additional monographs are to be produced
Flagship success cases update (first release)	<p>The report focuses on five flagship cases of APPR biomass utilization: Domaine Xavier Muller (France), Vineyards4heat (Spain), ITC Shabo (Ukraine), Pélets de la Mancha (Spain) and Fiusis (Italy)</p> <p>Available at: http://www.up-running.eu/wp-content/uploads/2017/10/uP_running_D6.3-Flagship-cases-report-v1_.pdf</p>



Step 3: Development of APPR biomass value chain

Precondition: within some territory there is a definite potential of APPR biomass that can be transformed into solid biofuel with high market value.

Then:

identify actors who can participate in the APPR biomass value chain

⇒ use the **template for actors of a value chain (Annex III)**.

important to select beneficiaries (farmers, cooperatives, productive associations, entrepreneurs, etc.) which express a strong intent in setting up new bioenergy value chains based on the use of APPR biomass (“prime movers”).

explain them value chains operation and cost for their performance

⇒ use the **template for value chain operations (Annex IV)**.

The consultant can use **consistency check template (Annex V) for VC organization**, including the operations carried out at the farm to collect the APPR biomass.



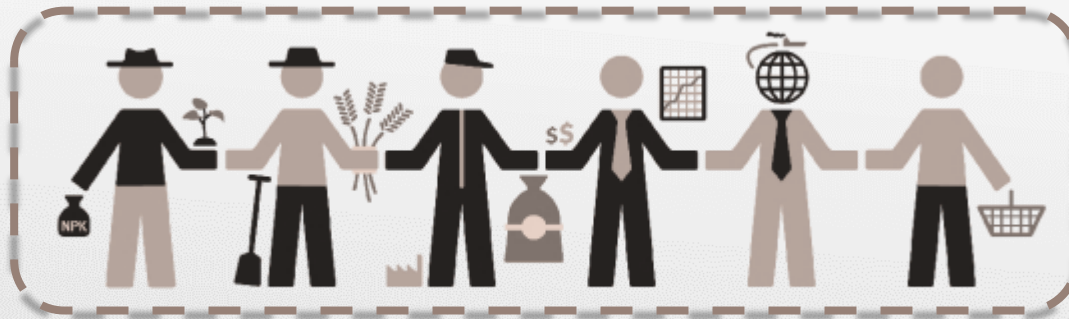
Policies, regulations,
incentives



Social perception favorable



All value chain actors should obtain a benefit



Benefits

Tangible

Intangible

New incomes
Economic savings
Time savings, etc.

Avoid pests
Avoid fire risks
Reduce CO₂

Image of sustainable business
Differentiation from competence
Independence from fossils, etc.



Find a benefit for everybody

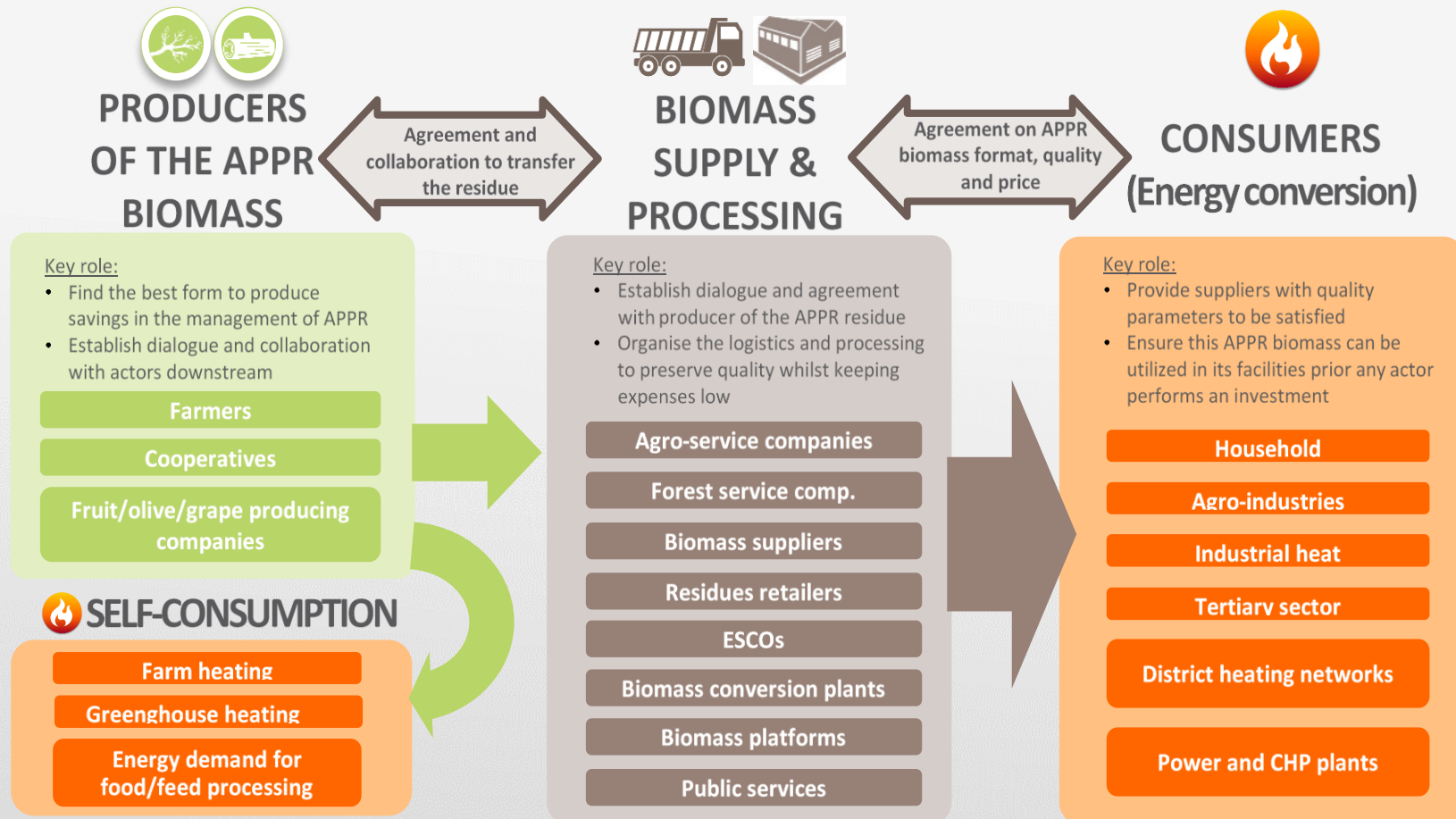
Multiple barriers and difficulties are possible

SO, it is important to find a benefit
for all actors of the value chain:
from farmer to consumer



More detailed information about the development of APPR value chains and technical operations are in the
monograph “Biomass from APPR: a feasible practice”.

APPR biomass VC: types of actors, interrelations and main roles





All actors should be on board; steps employed should be clear

- Farmers must understand that they get a benefit from the APPR management:
 - cost reduction
 - work simplification
 - less working time for residue management
- Limited interference with execution of standard agronomic practices
- Transparency in business model, difficulties, communication
- Flexible and effective operations
 - Allow different harvesting methods to increase flexibility
 - Number of available machines should be able to cope with peaks in the demand for harvesting services
 - Use advanced systems for organizing logistics
 - Avoid unnecessary operations

Types of benefits

Two types of benefits:

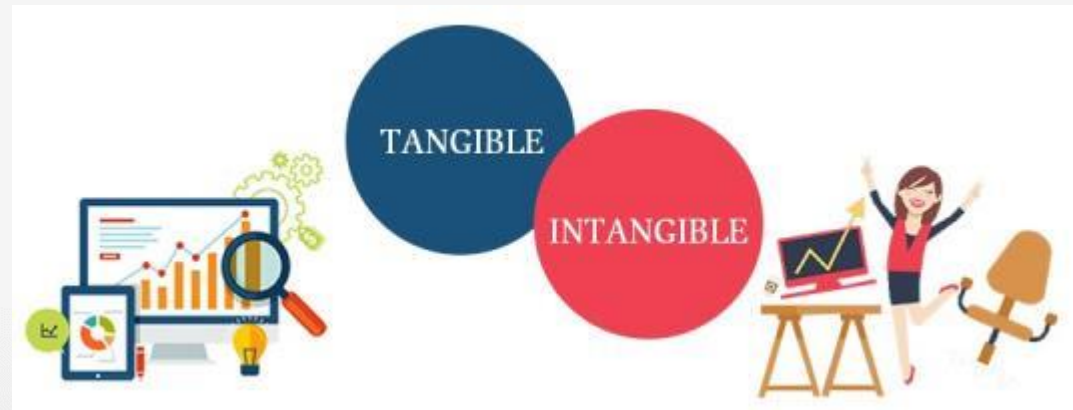
1. Tangible

- incomes;
- savings;
- time saved.

2. Intangible

- avoid pest risk;
- avoid fire risk;
- reduce CO₂;
- image of sustainable business;
- make a value chain actor's company different;
- independence from fossil fuels.

However, for business – most important tangible benefits, which make an APPR value chain **economically feasible**.

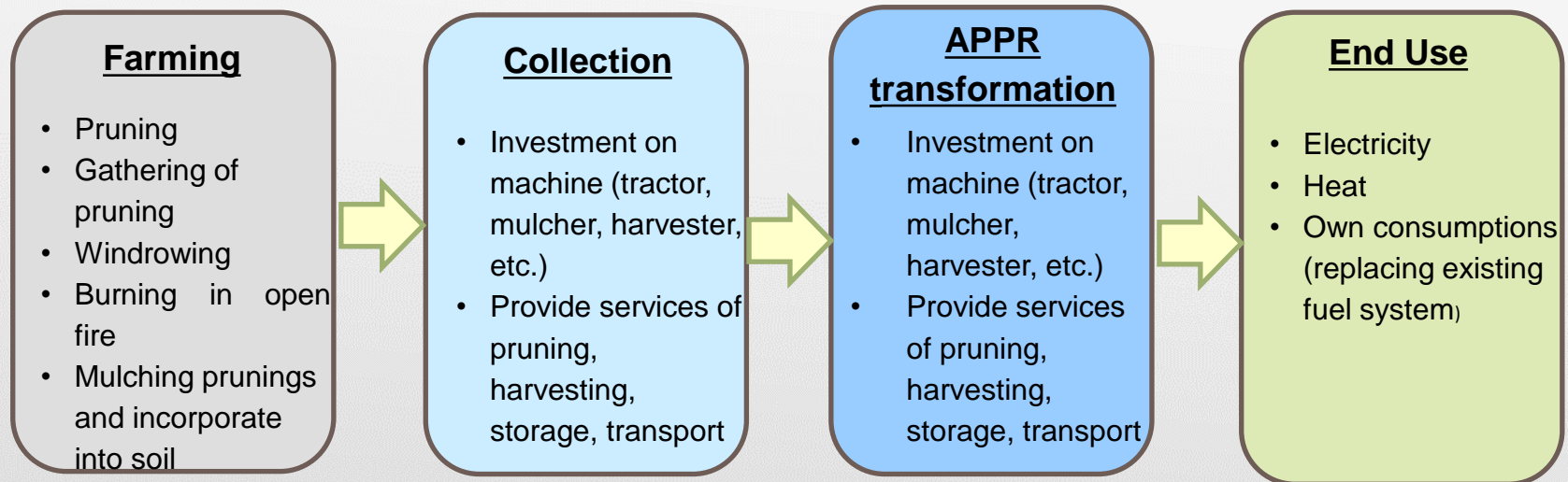




Groups of operations in an APPR value chain

To perform the economic evaluation of VC define the operations that may participate in each step of the value chain.

Based on these operations define the feasibility of the value chain based on the actor/activity.



Groups of operations in an APPR value chain: Farming

Farmers are the starting point of each APPR value chain. Farming activities can be clearly identified in any value chain.

The activities of this category along with the corresponding costs can be:

- Pruning
- Gathering of pruning
- Windrowing
- Burning in open fire
- Mulching prunings and incorporate into soil





Groups of operations in an APPR value chain: Collection

Collection activities include:

- contractors of harvesting machinery,
- agro-cooperatives or agro-service companies dealing with
 - treating,
 - collection,
 - transport of APPR from the field

Other possible costs:

- purchase/rent of the harvesting machine,
- purchase of the tractor,
- operational costs of the machinery (e.g. maintenance costs of the machinery, wages of the drivers etc.)
- storage costs of APPR
- logistic costs.



Groups of operations in APPR VC: APPR transformation

Typical example of an actor in the APPR transformation group:

pellet plant,

wood chips producer.

Main costs for these activities:

- Investment costs for the APPR upgrade process (e.g. static chippers, dryers, pellet presses, etc.)
- Operational costs for the APPR upgrade process (e.g. consumption of fuels for drying, electricity consumption, wages of personnel, etc.)

Income of an APPR transformer is generated from selling the upgraded fuel to the market or a specific end-user. The transportation/logistics costs of APPR to the market selling place or final consumer can be included in these types of economic actors or handled to an additional contractor, depending on the case.



Groups of operations in an APPR VC: End Use

Typical cases of this stage are

- to produce heat,
- to produce electricity or
- both (co-generation).

Electricity or co-generation - specific end-user with particular requests.

Heat - end-user could also be specific:

- greenhouse,
- boiler in a winery, etc.
- or domestic market for biomass fuels, which consists of numerous small-scale end-users.



Groups of operations in an APPR value chain: End Use

Main costs:

- Investment costs for the equipment used in the APPR final energy production process (e.g. a biomass boiler/stove, a biomass gasifier/power plant, etc.)
- OR the investment cost required for the retrofit of an existing bioenergy system in order to handle APPR biomass (e.g. new feeding line, new cleaning equipment, etc.)
- The operational costs for the APPR final energy production process



Possible cases of APPR biomass End Use

Two cases can be discerned:

- Installation of a new unit for bioenergy production from APPR biomass. For example, construction of a biomass power plant (selling electricity to the grid) operated by APPR biomass exclusively
- Fuel switch, e.g. replacement of an existing fuel source.

Note: in some APPR value chains the economic roles can be performed by a single actor:

single farmer that decides to invest in

- harvesting equipment (hence acting as contractor in collection operations),
- small-scale pellet press (hence acting as transformer in transformation operations)
- new boiler (hence acting as end-user) in order to switch the heating fuel from oil or another type of biomass to APPR.



Another case...

...when a farmer takes on the role of contractor and invest in harvesting machines for himself and sell the biomass to a pellet plant.

Examples of different make-ups of the value chain can be found in

- *uP_running Observatory,*
- *monographs,*
- *flagships success cases update (first and second releases)*
- *presentations 1 “Main highlights and issues for energy use of APPR biomass” of the training materials.*



Costs and Incomes of each Group of operations in APPR Value Chain

Costs and Incomes of each Group of Operations in APPR Value Chain				
	Farming	Collection	Transformation	End use
Investment costs	Usually zero	Harvesters, tractors, trailers, etc.	Static chippers, dryers, pellet production lines, etc.	Boiler/stoves, power plant, retrofits to existing facilities
Operational costs	Wages for windrowing of prunings, costs for external contractors	Fuel for operation, wages, maintenance, etc.	Fuels/electricity for production, wages, maintenance, etc.	Wages (if applicable), maintenance
Income	Usually zero	From selling APPR biomass with markup, providing services to farmers	From selling APPR biomass with markup	From selling electricity to the grid, heat to a DH network or final consumer, etc.
Savings	Reduced cost of pruning management compared to alternatives (e.g. mulching, open-field burning)	N/A	N/A	From cost reduction compared to alternative solutions, e.g. natural gas/oil heating, etc.



Additional organization details and price data

The **Observatory templates** consider the following:

End-use of APPR biomass - each value chain model incorporates one major type of end-user(s) of APPR biomass:

- self-consumption,
- industrial heating,
- public-private buildings,
- distributed heating networks,
- biomass to market
- other cases, e.g., power plants.

Radius of operation (in km) - usually, the more APPR biomass is mobilized, the larger the radius of operation is. The radius of operation can also be extended if the APPR biomass is upgraded in such a way, e.g., through palletization, so that transportation over large distances to end-users becomes economical.

Storage options - the template investigates whether this storage is performed

- on the farm,
- in intermediate storage points,
- directly at the end-user
- APPR biomass is consumed directly, without any long-term storage taking place.



Additional organization details and price data

Ownership of harvesting equipment - significant investment in APPR value chains, especially for farmers.

So, it is interesting to note if such a machine is owned

- by the farmers themselves,
- the community/municipality,
- 3rd parties
- if it is leased
- or other arrangements have taken place.

Price information - detailed cost information may be restricted for reasons of business confidentiality but cost information is often available.

! Compare the final price of APPR biomass (in €/t) and other fuels available in area:

- “regular” wood chips,
- ENPlus pellets,
- domestic heating gasoil, etc.

=> indications about the attractiveness of APPR biomass vs. market alternatives.



Related materials you can find in the Handbook:

Material	Short Description
ANNEX III “Template for value chain actors”	This template will be helpful to get information about the APPR biomass VC actors
ANNEX IV “Template for value chain operations”	This template can be used to find out the APPR biomass VC operations
Monograph “Biomass from agricultural pruning and plantation removals: a feasible practice promoted by <i>uP_running</i> ”	This monograph provides an insight into the current status of use of APPR biomass, its difficulties, the possible alternatives to organize a value chain, and some practical recommendations to do it. Still two additional monographs are to be produced
Flagship success cases update (first release)	The report focuses on five flagship cases of APPR biomass utilization: Domaine Xavier Muller (France), Vineyards4heat (Spain), ITC Shabo (Ukraine), Pélets de la Mancha (Spain) and Fiusis (Italy) Available at: http://www.up-running.eu/wp-content/uploads/2017/10/uP_running_D6.3-Flagship-cases-report-v1_.pdf
Template for APPR Value Chains	This questionnaire will help to take data for Value Chains-Prunings and Plantation Removal Available at: http://www.up-running-observatory.eu/file_uploads/9_en_Template%20for%20APPR%20Value%20Chains.pdf
Presentations 1 of the training materials	Main highlights and issues for energy use of APPR biomass



Step 4: Risk assessment of APPR biomass project

Risk assessment - to find out next stages for APPR project planning.

Using SWOT analysis will help you to

- widen the view,
- detect external threats or opportunities
- underline the main strengths of the entrepreneur and other actors.

Matrix for the SWOT analysis of the APPR biomass value chain

	Helpful to achieve the objective	Harmful to achieve the objective
Internal origin	Strengths <ul style="list-style-type: none">• Large potential of APPR in the region;• Availability of own raw resources;• ...	Weaknesses <ul style="list-style-type: none">• Poor experience in logistics of residues, knowledge required in value chain development;• Additional machineries required;• ...
External origin	Opportunities <ul style="list-style-type: none">• Development of local biofuels market;• Supplies channels diversification;• ...	Threats <ul style="list-style-type: none">• Lack of experience in management of energy machineries, machineries for harvesting and processing, grinding of APPR;• Competition for biofuels consumers among small producers and state-owned monopolies;• ...



Step 4: Risk assessment of APPR biomass project: SWOT analysis

Consultants and APPR value chain actors will use SWOT analysis to identify barriers and possibilities

=> to find effective solutions for APPR projects.

A possible output of this analysis may be a recommendation to establish some specific alliance, in order to face a potential threat.

Related materials you can find in the Handbook:

Material	Short Description
Guidelines for business model definition and risk assessment	These guidelines will help for risk assessment of developed APPR biomass VC



Next steps for APPR biomass project development

Sustainability assessment

RED (EU Renewable Energy Directive 2009/28/EC):

no direct impacts (i.e. no GHG emissions or energy consumptions) should be assigned to the agricultural phase of a bioenergy value chain if crop residues (such as pruning) are removed from the agricultural land with the purpose of energy conversion. But soon the **RED II** will be adopted and there will be mandatory sustainability criteria if the solid biomass thermal input in an installation is more than 20 MW.

For assessing the environmental impact of a potential APPR value chain, you may use two different documents developed by the uP_running project:

1. The “**Guidelines for sustainability assessment**” and the **related Excel file**. Through this tool, GHG emissions from the APPR value chain are calculated as CO₂ equivalent emissions => This may be useful in case an entrepreneur is interested in knowing the CO₂ savings he/she may avoid by the new initiative.

Can be particularly useful for agro-industries, wineries or city councils who want to give a “sustainable image” (see intangible benefits, section 3.3.3.2). In the next figure, example of figures obtained thanks to this template are depicted.



Calculation of CO_{2eq} saving

Savings of CO _{2eq} emissions		Min. requirement – RED II
Savings, electricity	72.39%	80%
Savings, heating	77.60%	80%
Savings, cooling	72.00%	80%

Distribution of total CO_{2eq} emissions along each value chain step

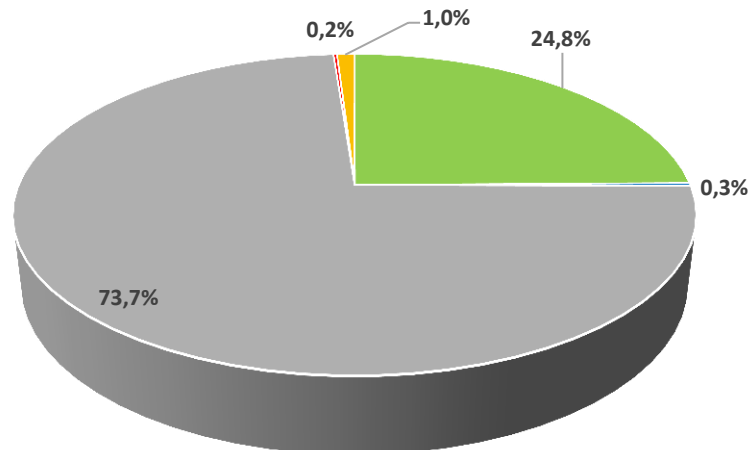
■ Harvesting APPR Activities

■ Haulage of APPR from field

■ APPR upgrading

■ Distribution of APPR to end user

■ Final Conversion of APPR





Sustainability assessment

2. The pdf document “Assessment of sustainable soil conditions to remove fruit tree residues from pruning and uprooting operations”

aims to check if the use of APPR biomass-to-energy is possible or if it is preferable to let prunings on the soil.

You will be able to evaluate if a specific initiative of utilisation of residues from pruning and uprooting operations is compatible with the sustainable management of agricultural soils.



This may be useful to check this issue for each entrepreneur supported, i.e., to check prunings may be removed from field without affecting soil sustainability –
More details see in the Handbook for consultancy



Related materials you can find in the Handbook:

Material	Short Description
Guidelines for sustainability assessment	These guidelines show how to perform the environmental assessment in order to evaluate the environmental impact of APPR value chain
Criteria for beneficiary selection sustainable soil conditions to remove fruit tree residues	This document proposes an evaluation approach in order to assess if APPR biomass should be removed from the field and used for energy purpose or, conversely, should be preferably released on the soil
Guidelines for the Feasibility Study of APPR VC	These guidelines show how to perform a feasibility study in order to evaluate the economic performance of APPR value chains

5.4. PHASE IV.

Transfer results



PHASE IV. Transfer results

PHASE IV - consultant will prepare the final report

- to present results of the consultancy
- to identify the possibility of APPR biomass value chain development
- to be used by prime movers and other stakeholders, who can be actors in the APPR biomass value chain.

Depending on the entrepreneurs' needs (identified during PHASES I-II, and confirmed in PHASE III), one or several of the templates can be filled in by the consultant and provided to the entrepreneurs in order to indicate the main results of assessments:

- APPR biomass potential
- Local biomass market
- APPR value chain actors
- APPR value chain operations





Related materials you can find in the Handbook:

Material	Short Description
ANNEX VI “Template for final report”	This template can be used for providing structured information about APPR biomass VC to the receiver of the consultancy services

6. Conclusions and recommendations



Conclusions and recommendations

1. Now you know the main steps undertaken to provide consultancy on APPR biomass use for energy. This methodology of consultancy can be adopted to different needs of an entrepreneur who asked for the consultancy – it can be “lighter” or “deeper”.
2. Doing consultancy within uP_running project under AP and TP support you will systemize this knowledge and get the “taste” of consultancy.
3. Because of the APPR biomass features, its value chain has different variants of realization and not always feasible – **BE OPEN-MIND!**
4. There is no standard solution or model for all APPR value chains development – **LOOK FOR YOUR BETTER DECISION!**
5. Success of the APPR projects requires an individualized approach including the support of trained consultants and/or expert knowledge – **BE ACTIVE!**



Take-off for sustainable supply of woody biomass from
agrarian pruning and plantation removal



Take-off for sustainable supply of woody biomass from
agrarian pruning and plantation removal

Training Case in Ukraine – Application of the Methodology for consultancy

Training Session 3

Call H2020-LCE-2015-3
Coordination and support action

June 2018/UCAB



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Training Session 3. Content

1. Application of the Methodology for consultancy

1.1. **Phase I.** Initial identification about the entrepreneur and early information

1.2. **Phase II.** First field visit and consultancy planning

1.3. **Phase III.** Analyze and supplement of information (incl. questionnaire for field sampling pruning)

1.4. **Phase IV.** Transfer results

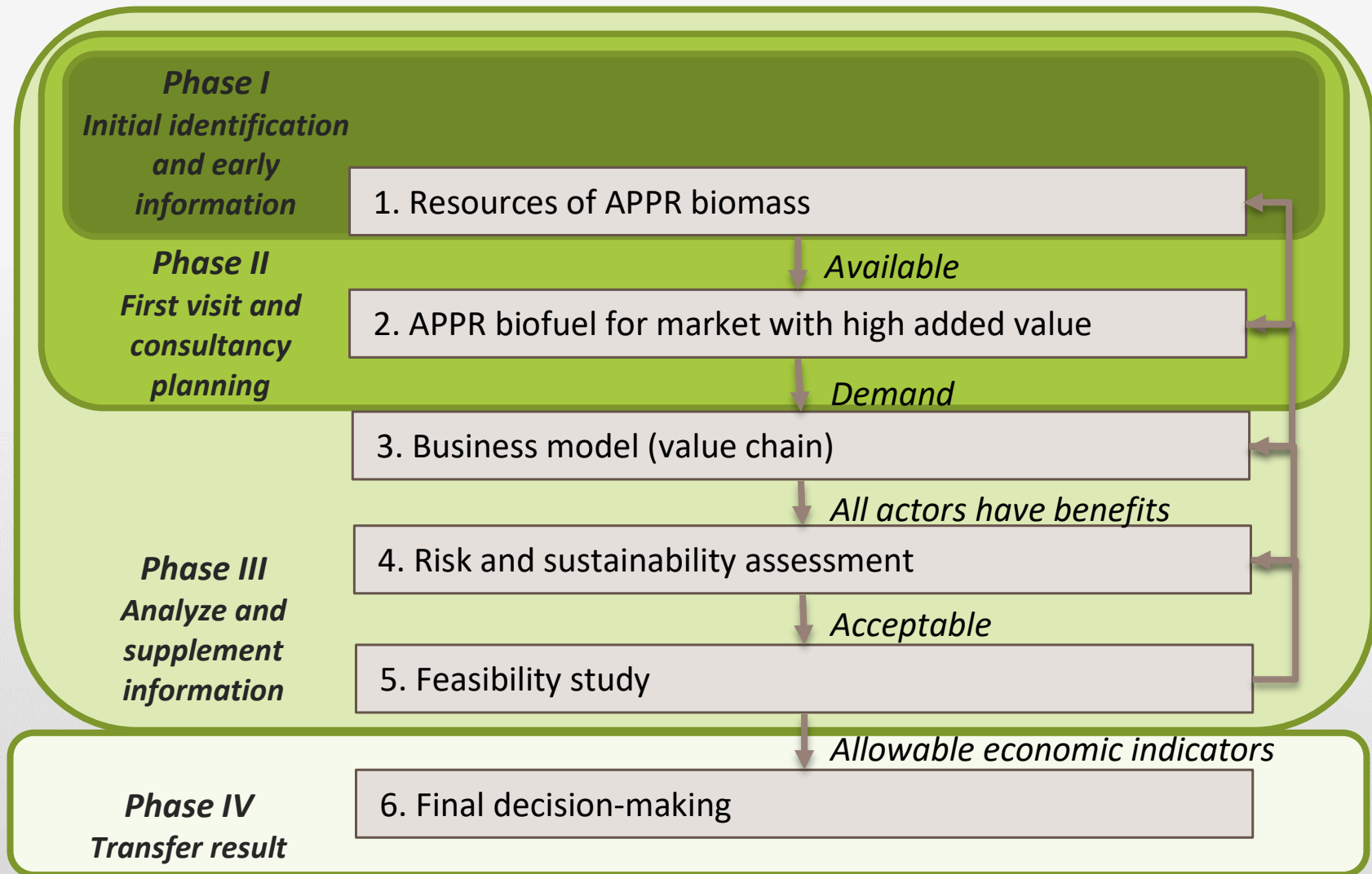
2. Lessons learned

3. Future prospectives and recommendations

1. Application of the Methodology for consultancy



Phases and stages for the implementation of a new value chain based on APPR biomass





Methodology for Consultancy

PHASE I

- a consultant will identify and get preliminary information about the entrepreneurs that may receive the consultancy service, i.e., farmers, agrarian services company, cooperatives or another kind of companies that are interested in starting or participating in a new value chain based on APPR biomass

PHASE II

- the consultant will organize a meeting to explore deeper the initiative proposed by each entrepreneur(s) and to discuss what are his/her main needs and priorities

PHASE III

- consists in analysing the information gathered previously and solving the main doubts or questions of the entrepreneur as regards a possible value chain implementation, e.g.: How much APPR biomass do I have? What is the quality of my biomass? What is its value? Which operations are needed to collect it? Is it feasible technically? Is it economically profitable? Etc.

PHASE IV

- the consultant will prepare a simple report about the consultancy services and will transfer results to the entrepreneur.

1.1. Phase I. Initial identification and early information



Phase I. Initial identification

1. The **consultants will find** APPR biomass producers and other potential value chain actors, who can be interested in new “pruning-to-energy” initiatives.
2. The **main goal of Phase I** consists in **finding the potential entrepreneurs** and getting preliminary information about their proposed initiative
3. A **first assessment of the APPR biomass** potential may be performed based on the amount of hectare of APPR biomass in this area and on the first round of the contacts with producers of APPR biomass
4. It is important **to determine the current use of the pruning** and plantation removal by the farmers (e.g. mulching on soil, open-air burning, etc.)



How to start?

Methodology	Ukrainian Case
Make a list of stakeholders with contact information from the local farmer associations, data basis, municipality, business association, etc	We start with list of participants of UCAB Agrischool project related to horticulture
First round of phone callings or emails	Invitation to the 1 st up_running workshop
The second round of contacts and meetings	Phone calls & emails



Identification - How partners identify/get into contact?

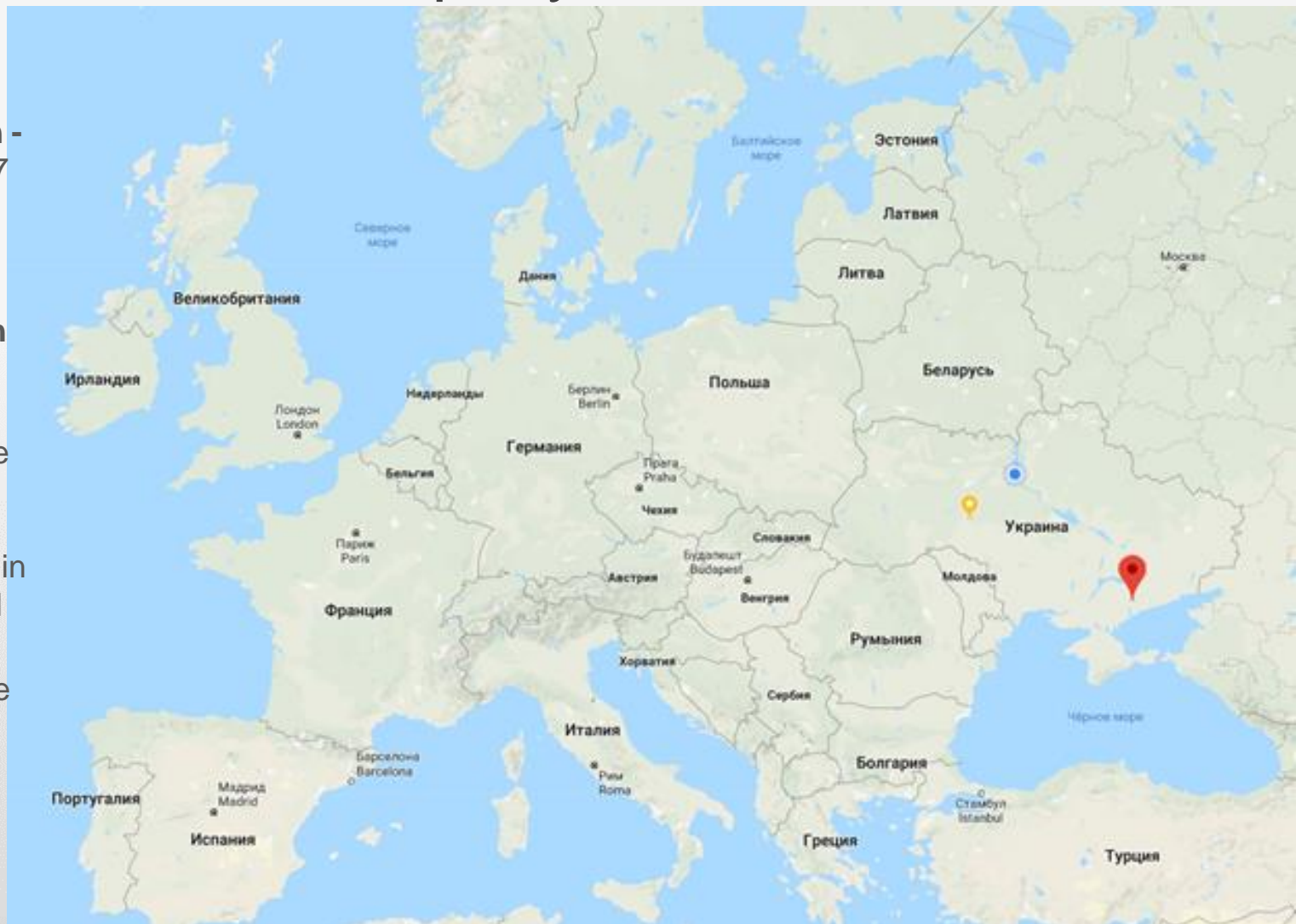
- **The entrepreneur Vasyl Mikulyn**, CEO of the Black Sea Fruit Company (BSF Co) took the idea of APPR biomass value chain for his company from the **1st Seminar-forum of the uP_running project**, which was in Vinnytsia on the 31st of May 2016. The BSF Co representatives were invited by **up_running team** to join 1st workshop in Vinnytsa region (after first meeting they were very active in their desire to take part in the next project activities)
- **BSF Co Chief engineer Ivan Melnyk** discussed with the Ukrainian up_running team **the possible configuration of the value chain operations**. He was very open and active in his willingness to cooperate
- During following workshops, conferences, discussions after and before meetings and questions during presentations the representatives of **BSF Company were very active**
- The company is **very famous at the Ukrainian horticultural market** with huge area of land in the South of Ukraine
- The entrepreneur is **open mind**. He and his team have given us all necessary information. Very important not to waste time during contacts and meetings.





BLACK SEA Fruit Company Ltd

- 1. Date of foundation -**
December, 09, 1997
- 2. Location -**
Priazovskiy climatic district, Zaporizhia region on the **South of Ukraine**
- 3. Mission –** a private economic enterprise with the purpose of growing and sale of agricultural product in Ukraine and abroad
- 4. Total area - 240 ha**
(of which 149 ha are pome and stone orchards in productive phase)





BLACK SEA Fruit Company Ltd (BSF Co)

- Beginning from 2005 the company planted **40 ha of sweet cherry**,
- 2007 – **20 ha of strawberry**,
- 2008 – 2009 – **50 ha of apple-tree**
+ sweet cherry - 70 ha, cherry - 2 ha, plum - 15 ha, pear - 10 ha, apricot - 2 ha
- BSF Co grows some of **the best quality apples** in places that are ideal for successful gardening in Ukraine. The range of the company are classic apple varieties such as: Breburn, Jonagold, Apache, Summer Red, as well as promising new varieties Kings, Fuji, and of course our business card - Golden Delicious variety.
- BSF Co with its inception cultivated **cherries** in Melitopol region. Melitopol is widely known for its **climate and soil ideal** for growing cherries. The company is proud to be one of the major companies that sell Melitopol cherries not only in Ukraine but also abroad. Apart from the fact that BSF Co grow traditional varieties Melitopol origin such as: Melitopol black, Valery Chkalov and June early.
- Today management of the company is continuously **expanding its markets** in Ukraine and outside of the country. They are looking forward for a deeper integration with West European market



Phase I - recommendations

1. For this first round of contacts with APPR biomass producers, the consultant can use the templates for assessment of APPR biomass potential to collect necessary data

Materials related

Material	Short Description
"Template for APPR biomass potential assessment"	If the entrepreneur is APPR producer (e.g. farmer or cooperative), this template will be helpful to collect and register data related to the APPR resources

2. You can find it on section PROJECT MATERIALS on uP_running webs

1.2. Phase II. First field visit & consultancy planning



1.2. Phase II. First field visit & consultancy planning

- The **consultant organizes a meeting** with the entrepreneur and makes a first visit to the entrepreneur's installations in order to collect primary information as regards the APPR biomass initiative
- The **main goal of the Phase II** of the first visit is to explore deeper the initiative that is proposed (i.e., which type of APPR biomass, which actors and potential business model, which types of costs, etc.) and to discuss what are the main needs and priorities of the entrepreneur.



First field visit

- Planning of the first visit:
 - How did we plan the 1st visit?
 - The **first discussion** was during **1st up_running workshop in Vinnytsa reg**
 - Before the 1st visit UCAB and SECB specialists **communicated many times** by phone and email with CEO, his engineer and agronomist. We've got information about the company (incl. cultivated area, species of tries and varieties, etc.)
 - Before the physical visit we knew what we could see and prepared list of questions such as in the **Annexes I-V of the Handbook for consultancy**.
 - We arranged day and time for the first visit in 2017 – March 2017
 - How many persons?
 - The first visit – March 2017
 - One – Alex Donchenko (UCAB)
 - The second visit – March 2018
 - Two – Alex Donchenko (UCAB) & Semeon Drahnev (SECBIO)
 - Documents to support meeting?
 - uP_running 1st leaflet, printed presentation about up_running project



First field visit – March 2017

As result of the first field visit you (as a consultant) should have a clear idea about:

- Objectives and main needs of the entrepreneur
- Type of initiative/model to be implemented
- Weaknesses and gaps of the initiative
- Type of supported activities and schedule for next steps



The Black Sea Fruit Co's office (first visit, 2017)



The Black Sea Fruit Co's orchard (first visit, 2017)



BSF Co Objectives & needs



- BSF Co was preliminary going to make mulch from its APPR biomass, but **the entrepreneur tried to find cheaper way for natural** gas substitution in the heating systems of the office and other buildings
- wants **to explore opportunity of self-sufficiency** devoted to the company's business energy demand and also **seeks to build heating power production plant for local clients** nearby business location
- seek to understand optional costs of **bio fuel from APPR's** residues to optimize energy costs through avoiding usage of APPR residues as firewood for old school boiler
- **company's management** does consider an option to produce not only heating energy, but also electric power on bio technology based on APPR's residues and other farming accompanying goods
- **has no experience before** of efficient APPR use for energy



BSF Co Objectives & needs



- BSF Co seeks to get consultancy devoted to **feasibility of APPR's optional business models** considering mentioned above most favorable APPR's usage prospects according with company's resources and goals
- The Ukrainian uP_running team has given advices **how to expand the use of the APPR biomass for energy**, and the big challenge was how better to organize the wood chips drying and storage



Second visit, March 13, 2018



*Pruning of the
apple orchard*



*Chipper and trailer in the
hangar*





First-Second field visits

- During the visits the project consultant discussed with CEO and his team questions related to APPR, inspected the existing resources and technical equipment and made the **necessary field measurements**
- After first visit we could find out the general description of the **potential VALUE CHAIN**
- You can find the templates in
 - Handbook for Consultancy: Annex IV Template for value chain operations”,
 - on section PROJECT MATERIALS on uP_running webs



Result of the conversation - Initial scheme of the value chain

VALUE CHAIN ACTORS		Farmers	Farm cooperative / agro productive organization	Agro machine builder /seller	Agro services Company	Techno-logistics services in agriculture	Biomass energy plant builder /dealer	Energy service company	Biomass consumer energy user
VALUE CHAIN PROCESSES	APPR biomass producer	1 2							
	Harvesting & conditioning	2 1							
	Biomass 1 st Haulage/ Transport	1							
	Pre-treatment & storage	1							
	Biomass further processing	1							
	Biomass transport	1							
	Energy conversion	1							3

- Actor 1:- Vasyl Mikulin, director of BLACK SEA fruit company Ltd. operating in fruit orchards business.
- Actor 2: - Grynciv Ivan, director of Melitopolska Chereschnia Llc. operating in fruit orchard business (additional supplier of APPR biomass)
- Actor 3:- municipal heating power generation and/or service company.(it was identified as a prospective final consumer of the value chain after approved & implemented self-consumption model)

Initial Value Chain – identification of key actors

- After the first field visit potential key actors of the potential value chain were identified:
 - Local farmer – Black Sea Fruit Company Ltd
 - Transport Company – Transport service of the Black Sea Fruit Company
 - Final Consumers - Final consumer use the wood chips for the heat production for own needs





General objective of the proposed value chain

My current situation, is not my final destination

- **Current situation:** The BSF Co
 - - produce heating in small amount to provide its office estate with heating energy in winter season
 - - for internal demand of heating energy, company uses old-school boiler on firewood, but it's not capable to utilize even partial volume of APPR residues to technological backwardness.
 - - certain portion of APPR's firewood utilized in the boiler for partial heating of the office estate storing back large volumes of APPR's wooden biomass each production season
- **Objective:** To show the possibility of APPR residues utilization for energy generation purposes based on company's own horticulture orchards, nearby market – city of Melitopol, Konstantynivka, Voznesenka and other locations
- **The company looks for consulting assistance in development of new value chains** considering heating power production and APPR's by-products commercialization. Assistance in raw APPR's supplies organization (testing of supplies) may be done for the company also with additional consultancy and support





The results

The results of our 2 visits does demonstrate

- A) For the value chain as a whole
 - development of new value chain requires additional costs (+14,2 €/t) which is compatible with prices on bio fuel in the country. The proposed value chain has sufficient level of competitiveness considering market prices for wood chips in Ukraine (29-35 €/t) and “Green Tariff” in case of sales of electric power to national electric power market. Utilization of APPR’s wooden chips for electric or heating power generation is feasible even in case of 100 km transportation distance.
- B) For every actor participating in the value chain
 - The primary cost, 20 €/t of wooden APPR’s chips production will be taken by Actor 1 (BLACK SEA fruit company Ltd.). Actor 2 will not have any kind of additional costs due to remained APPR’s management practices of wooden residues, hauling. Thus, Actor 1 will have APPR’s wooden bio fuel ready to produce heating and electric power
- C) Financial capacity to purchase machinery
 - Actor 1 does possess required equipment for hauling of APPR’s residues the same situation considering Actor 2. Actor 1 will have to rent movable chipping machine, value of which included in price.



TIMELINE of the consultancy activities – BSF Co case

Phase	Steps	Type of activities	Date	Description
I – Initial identification and early information	1	First contact	May 31, 2016	Idea of APPR biomass for energy
	2	Next contacts by phone and email	June 2016 – February 2017	Confirmation of the entrepreneur interest
II – First visit and consultancy planning	3	First visit	March 2017	Field measurements APPR biomass potential, APPR biomass quality and market value, information for value chain (possible actors, operations, etc.)
III – Analyze and supplement information	4	Second visit	March 2018	Field measurements, data from demo, analyse and supplement information
	5	Third visit	March 2018	
	6	Contacts by phone and email	March 2017 – June 2018	
IV – Transfer results	7	Contacts by phone and email	July – August 2018	Report

Selection process according to the project timeline



Recommendations

- For this Phase II, the consultant can use the following templates

Material	Short Description
ANNEX I “Template for APPR biomass potential assessment”	If the entrepreneur is APPR producer (e.g. farmer or cooperative), this template will be helpful to collect and register data related to the APPR resources
ANNEX II “Template for local biomass market”	If the entrepreneur can be a consumer of APPR biomass, this template will be helpful to get information about the local biomass market and find out the possible price of APPR biomass
ANNEX V “Consistency check template” Part 1, “APPR utilization model”	It presents the different forms to organise a value chain and, for each, the items to be checked in order to assess the consistency of the initiative
ANNEX VIII “Attendance sheet”	This sheet will be helpful for confirmation of a visit/meeting and collection basic data about participants

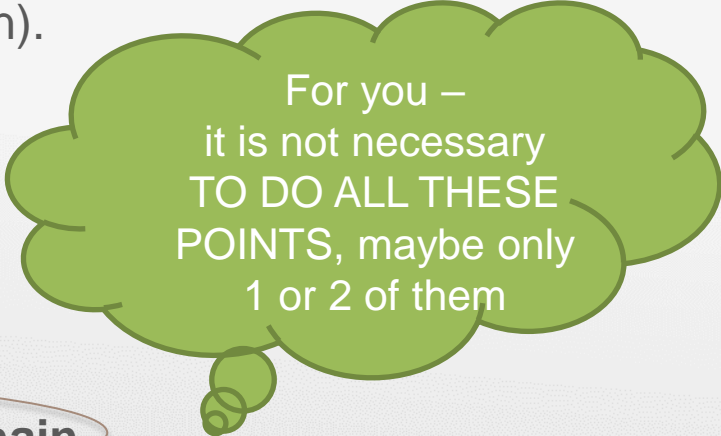
- You can find it on section PROJECT MATERIALS on uP_running webs

1.3. Phase III. Analyze and supplement of information



Phase III. Analyze and supplement of information

- The **main goal** of the Phase III - analyzing the information gathered previously, providing documentation to the entrepreneur and, finally, solving the main doubts or questions of the entrepreneur has regarding a possible value chain implementation (or participation).
- **It MAY** include different important steps:
 - **Field data gathering**
 - **APPR biomass quality and market value**
 - **Development of APPR biomass value chain**
 - **Risk assessment of APPR biomass project**
 - Identifying next steps for APPR biomass project development



For you –
it is not necessary
TO DO ALL THESE
POINTS, maybe only
1 or 2 of them



Field data gathering - how to perform measurements?

- **Three methods** are proposed, applicable to both pruning and full tree biomass:
 - by tree;
 - in parcels;
 - in whole field or along several rows(more detailed about field measurements - **Observatory tool**: The guidelines about measurement show how to perform measurements of the wood produced by hectare in horticultural plantations, i.e., the biomass productivity, also called biomass yield or biomass potential.)
- First of all, a method has to be selected in order to carry out the biomass productivity measurement
- It is necessary to collect information from a series of factors since all of them may influence the productivity of APPR biomass that will be measured thanks to developed **Questionnaire** (Annexes I-V of the Handbook for consultancy).
- The measurement's result (amount of prunings/plantation removed, in t/ha) has to be introduced in the Questionnaire for the field sampling of prunings or plantation removal respectively (available on the Observatory website at: www.up-running-observatory.eu) along with some more information that affects quite much this data (how was the field, the crop, the agrarian practices, the last year, etc.). Although the Questionnaire seems to be large, questions should be easily answered by the field owner.



Field data gathering – case of BSF Co

- **How we gathered data and why they are interesting?**
 - We used internet site of the Black Sea Fruit Co for general information
 - Google Earth helped us to see where orchards were located, what roads could be used for transport APPR biomass, where boiler houses with solid biomass were placed and other.
 - We used internet for study local biomass market.
- We made **field measurements** and found out data for APPR biomass potential assessment. During demo we collected data of biomass productivity, mechanized performance, fuel consumption, etc. for **feasibility assessment**.
- **In this case** the results of field measurement showed that amount of APPR biomass obtained from annual maintenance pruning of apple orchards was from 3.1 and 3.7 t/ha, moisture content was ~ 46%
- Look at the printed version of Questionnaires
- We can download the Questionnaires for Field Measurements Prunings from Observatory tool:
 - http://www.up-running-observatory.eu/pdf_export/299_en-A.pdf
 - http://www.up-running-observatory.eu/pdf_export/298_en-A.pdf



Recommendations

- The field data will be useful to complete the template for assessment of APPR biomass potential

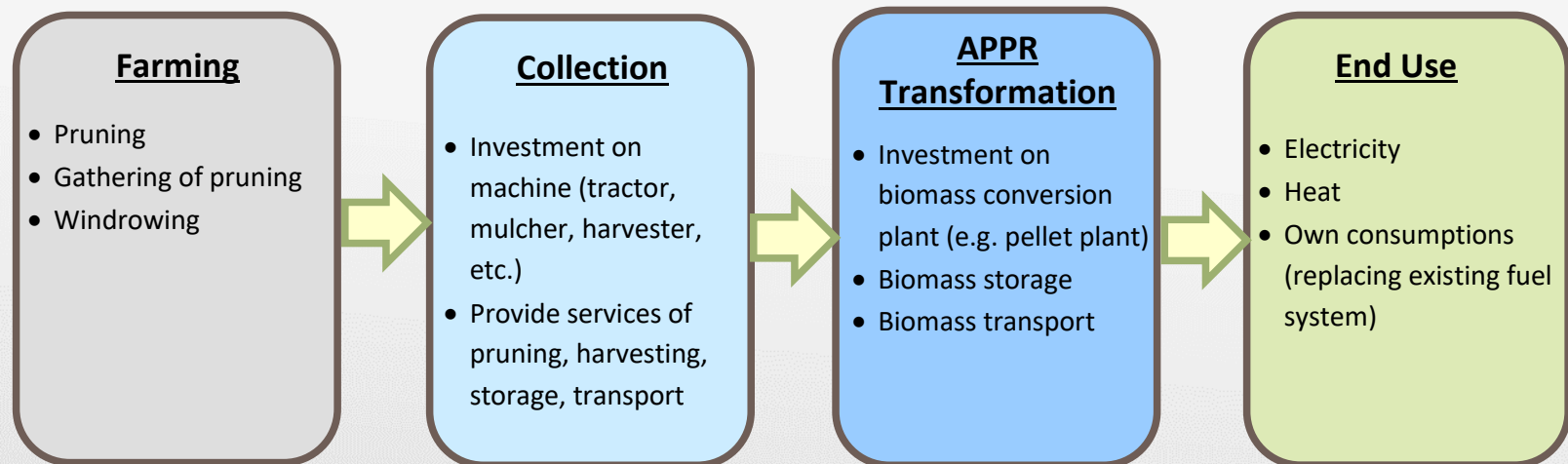
Material	Short Description
ANNEX I “Template for APPR biomass potential assessment”	If the entrepreneur is APPR producer (e.g. farmer or cooperative), this template will be helpful to collect and register data related to the APPR resources
Manual for field measurements on APPR biomass productivity	The detailed information about each step of field measurements on APPR biomass productivity is given in the manual Available at: http://www.up-running-observatory.eu/file_uploads/8_en_uP_running_guidelines_for_field_sampling_EN.pdf
Template for Field Sampling of Prunings	This questionnaire will help to take data for field sampling prunings Available at: http://www.up-running-observatory.eu/file_uploads/2_en_Template_for_Field_Sampling_of_Prunings.pdf
Template for Field Sampling of Plantation Removal	This questionnaire will help to take data for field sampling plantation removal Available at: http://www.up-running-observatory.eu/file_uploads/3_en_Template_for_Field_Sampling_of_Plantation_Removal.pdf

- You can find it on section PROJECT MATERIALS on uP_running webs



Development of APPR biomass value chain

Group of operations that take place in an APPR Value Chain



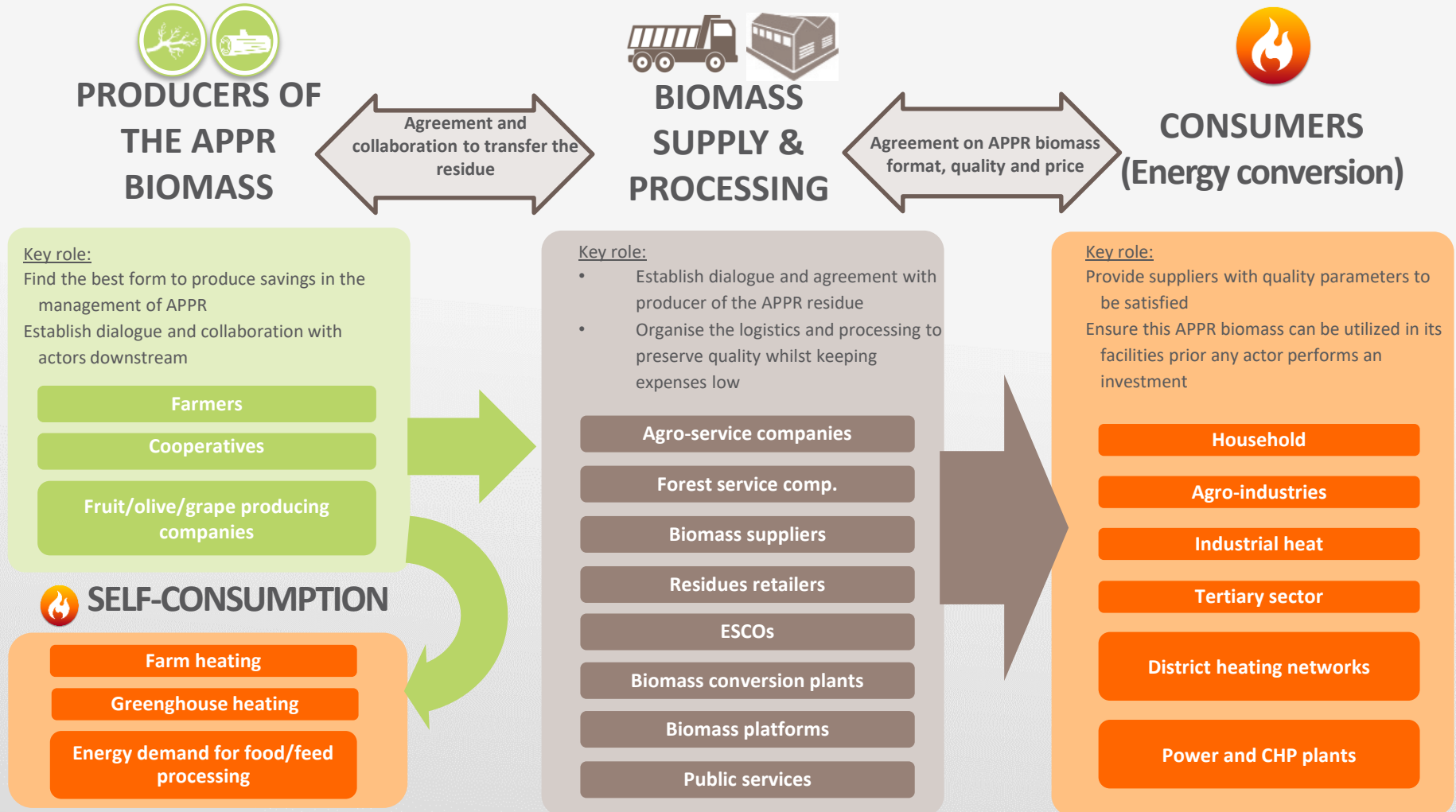


Development of APPR biomass value chain

Black sea fruit company APPR biomass value chain

Location	Zaporizhzhya oblast, Ukraine
Type of APPR involved	Prunings
Crop species used	Apples, cherry, plum, apricot
Year of initiation	2017
The volume of APPR mobilized (tons per year)	600
The surface area with permanent crops mobilized (ha)	209
Main product	Woodchips from APPR
Number of jobs created	4 part-time jobs

The three groups of key actors participating in the APPR biomass value chain: types of actors, interrelations and main roles





Role of actors involved in the BSF Co value chain

VALUE CHAIN ACTORS		Farmers	Farm cooperative / agro productive organization	Agro machine builder /seller	Agro services company	Techno-logistics services in agriculture	Biomass energy plant builder /dealer	Energy service company	Biomass consumer / energy user
VALUE CHAIN PROCESSES	APPR biomass producer	1							
	Harvesting & conditioning	1							
	Biomass chipping	1							
	Woodchips transportation 1	1							
	Woodchips storage	1		a					
	Woodchips transportation 2	1		b		2			
	Energy conversion	1							3

1 Local farmer (Black sea fruit company Ltd)

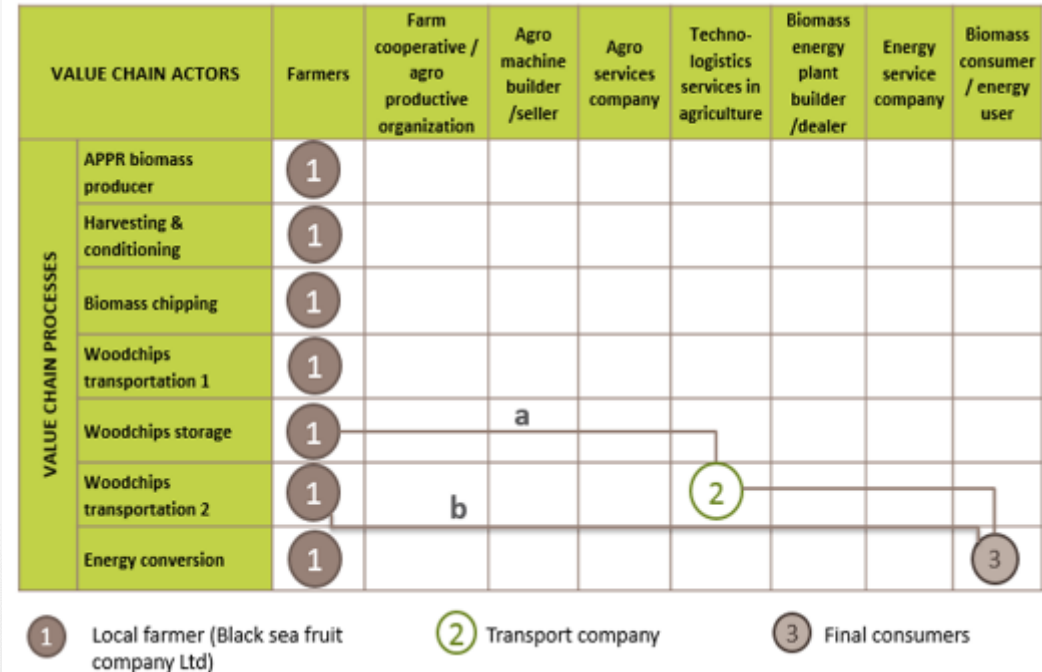
2 Transport company

3 Final consumers



Value chain

fruit trees from apple orchards of *the local farmer* (1 – BLACK SEA fruit company) are pruned with the farmer's workers manually every year.





Value chain

The APPR biomass is taken out from the orchard rows and is collected in the piles where it is stored in the open air.



After pruning, the workers put branches in the middle of the row. The tractor with forks pushes out the APPR biomass and collected it in piles.





Video (short video biomass collection)

You can find it on section PROJECT MATERIALS on uP_running website



Value chain

The biomass is dried and chipped by a manually fed chipper Heizohack HM 8-400 attached to the tractor and trailer.





Value chain

Wood chips are transported by the tractor with the trailer to the storage facilities. The tractor with the trailer transports the wood chips from APPR to the final consumers for the heat production.

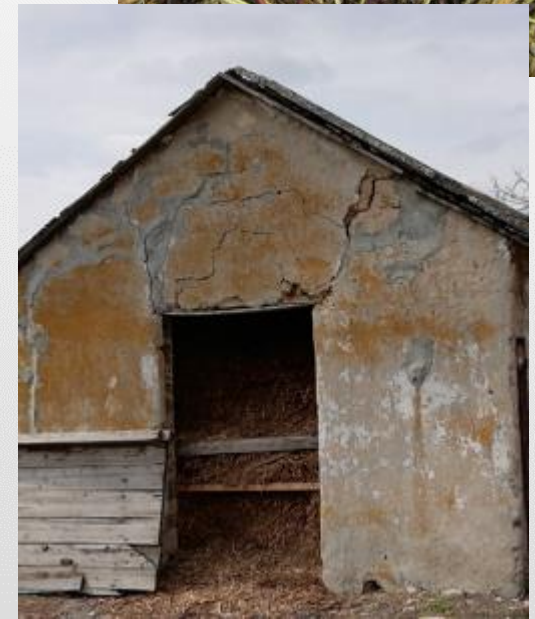




Woodchips from APPR biomass



Woodchips storage facility





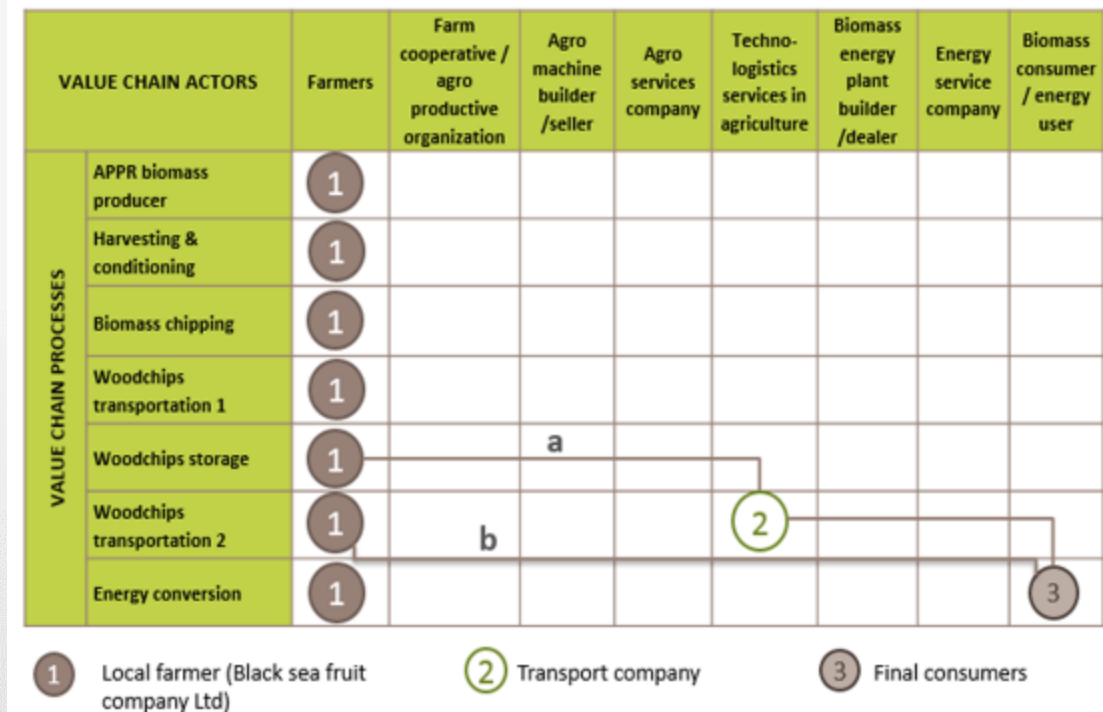
Value chain

The wood chips are transported to the storage facilities and stored up to the start of the heating season.

The farmer provides all the technological operations and transports the biofuel to ***the final consumer (3) in path (a)***.

In addition, he partly uses woodchips for his office heating as a self-consumption model of the value chain. Another option is involvement of ***the transport company (2)*** for woodchips delivery the to the final consumer ***in path (a)***.

Final consumers use the wood chips for the heat production.





Video of the full value chain

You can find it on section PROJECT MATERIALS on uP_running website



Recommendations

Material	Short Description
ANNEX III “Template for value chain actors”	This template will be helpful to get information about the APPR biomass VC actors
ANNEX IV “Template for value chain operations”	This template can be used to find out the APPR biomass VC operations
Monograph “Biomass from agricultural pruning and plantation removals: a feasible practice promoted by <i>uP_running</i> ”	This monograph provides an insight into the current status of use of APPR biomass, its difficulties, the possible alternatives to organize a value chain, and some practical recommendations to do it. Still two additional monographs are to be produced
Flagship success cases update (first release)	<p>The report focuses on five flagship cases of APPR biomass utilization: Domaine Xavier Muller (France), Vineyards4heat (Spain), ITC Shabo (Ukraine), Pélets de la Mancha (Spain) and Fiusis (Italy)</p> <p>Available at: http://www.up-running-content/uploads/2017/10/uP_running_D6.3-Flagship-cases-report-v1_.pdf</p>
<u>Template for APPR Value Chains</u>	<p>This questionnaire will help to take data for Value Chains-Prunings and Plantation Removal</p> <p>Available at: http://www.up-running-observatory.eu/file_uploads/9_en_Template%20for%20APPR%20Value%20Chains.pdf</p>
Presentations 1 of the training materials	Main highlights and issues for energy use of APPR biomass



Risks analysis and assessment

	Helpful to achieve the objective	Harmful to achieve the objective
Internal origin	Strengths	Weaknesses
	Many fruit orchards are nearby High demand for replacement of natural gas and reducing the cost of thermal energy Existing demand for biomass/biofuels Additional profit from sale of APPR biomass or heat Lack of problems with the organization of sales of heat energy	Seasonal heat load Insufficient qualification of workers when using of specialized equipment High capital costs of the project The economic effect is reduced in the case of transportation of the biomass and wood chips at long distances
External origin	Opportunities	Threats
	New activity for business Sales of thermal energy at a tariff lower on 10% from the price of heat from gas, if entrepreneur is start this type of business Development of domestic biofuels market Reduce consumption of fossil fuels (primarily natural gas) in the region Creating new jobs Reducing Greenhouse gas emissions	Increasing competition over time Reduction of the pruning amount through inappropriate conditions Infrastructure failure (including transport) to ensure sustainable and long-term operation of the facility Lack of qualified personnel for operation and maintenance facility The occurrence of unpredictable costs and project cost overruns Increase of operating costs, changing the exchange rate, raising interest rates on borrowed funds Breakdown of machinery



Risks analysis and assessment

- According to carried out SWOT analysis we suggest to the Entrepreneur following recommendations:
 - Many fruit orchards are nearby and BSF Co don't use the full productivity of chipper Heizohack 8-400. We proposed him to provide service for chipping of APPR biomass for other farmers. This will help to reduce influence of the machinery amortization costs on the chips production costs and provide extra income
 - Additional equipment of the chipper with mechanized loader will increase productivity of the machine and reduce the operation costs per ton of chips
 - For selling heat to consumers the Entrepreneur needs to create a heat supplier company
- The consultants and APPR value chain actors will use the results of the SWOT analysis to identify barriers and possibilities, which will give effective solutions for APPR projects.
- A possible output of this analysis may be a recommendation to establish some specific alliance, in order to face a potential threat.

Materials related

Material	Short Description
Guidelines for business model definition and risk assessment	These guidelines will helpful for risk assessment of developed APPR biomass VC

1.4. Phase IV. Transfer results



Phase IV – Transfer Results

- In the PHASE IV, the consultant will prepare **the final report** about the results of consultancy with the **identification of the possibility of APPR biomass value chain development**.
- The report is intended for an acquaintance of the entrepreneur and other stakeholder(s), who can be an actor(s) in the APPR biomass value chain.
- Depending on the entrepreneurs' needs (identified during PHASES I-II, and confirmed in PHASE III), one or several of the templates can be filled in by the consultant and provided to the entrepreneurs in order to indicate the main results of assessments:
 1. APPR biomass potential
 2. Local biomass market
 3. APPR value chain actors
 4. APPR value chain operations
- Moreover, a report with the main results of the consultancy may be provided to the entrepreneurs supported. A proposed structure for the final report is given in Annex VI. This report can be used to identify the next steps for the APPR biomass project development.

Materials related

Material	Short Description
ANNEX VI “Template for final report”	This template can be used for providing structured information about APPR biomass value chain to the receiver of the consultancy services (the “entrepreneur”)



Which templates/guidelines did we use mostly? Were they helpful, why?

- **Manual for field measurements** on APPR biomass productivity and **Template for Field Sampling of Prunings** we used for field measurements
- **Consistency check template** is helpful for demo preparation
- **Questionnaire for Mechanized Collection- Prunings, Template for APPR Value Chains, Guidelines for business model** definition and risk assessment, Feasibility study guidelines and template we used in Phases II and III

2. Lessons learned



Lessons learned

- To increase the profitability of the APPR biomass value chain the farmer should organize converting APPR biomass to the heat and sell it to the end user.
- If wood chips have the moisture content of more than 25-30%, they can be stored in piles in the open air during a hot summer season for drying. The storage facility with the roof is used for dry wood chips.
- Blunting of chipper knives have an exceptional influence of the wood chips quality. It is necessary to ensure the control for the sharpness of knives by the chipper operator.
- The wood chips can be used as a mulch to decrease water evaporation from the soil.

3. Future prospective and recommendations



Remarks about economics in an APPR value chain

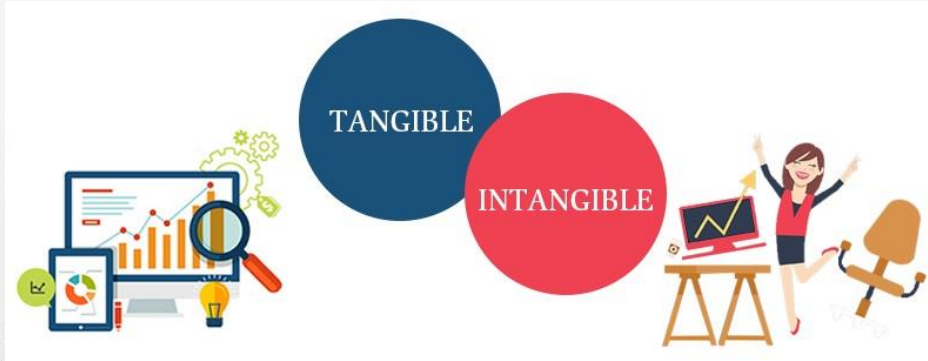
Costs and Incomes of each Group of Operations in APPR Value Chain

	Farming	Collection	Transformation	End use
Investment costs	Usually zero	Harvesters, tractors, trailers, etc.	Static chippers, dryers, pellet production lines, etc.	Boiler/stoves, power plant, retrofits to existing facilities
Operational costs	Wages for windrowing of prunings, costs for external contractors	Fuel for operation, wages, maintenance, etc.	Fuels/electricity for production, wages, maintenance, etc.	Wages (if applicable), maintenance
Income	Usually zero	From selling APPR biomass with markup, providing services to farmers	From selling APPR biomass with markup	From selling electricity to the grid, heat to a DH network or final consumer, etc.
Savings	Reduced cost of pruning management compared to alternatives (e.g. mulching, open-field burning)	N/A	N/A	From cost reduction compared to alternative solutions, e.g. natural gas/oil heating, etc.



Benefit

1. Any value chain requires that all participants get a BENEFIT. Then it may work.
2. Generally, there are two types of benefits:



- Tangible, as for example: incomes, savings or time saved
- Intangible, as for example: avoid pest risk, avoid fire risk, reduce CO2, the image of sustainable business, make a value chain actor's company different, independence from fossil fuels, etc.-

3. However, in many cases, the most important for business are the tangible benefits, which make an APPR value chain economically feasible.





Future prospective and recommendations - How did partners transfer the results?

- The entrepreneur needs a specific information for the future business on the APPR biomass which he can get in the Phase IV. Regular contacts with entrepreneur give important efforts for consultancy.
- Preliminary results helps BSF Co to increase of effectiveness of the APPR biomass value chain. This year (2018) the office building is under reconstruction. The old boiler is going to be replaced with the special biofuel boiler Heizomat HSK-RA 50 with the wood chips automatic feeding system.
- *The preliminary feasibility assessment indicates that the production cost of chips from prunings is about 750 UAH/t (about 25 EURO/t) without raw materials costs and the farmer sold such chips for 1000-1200 UAH/t (about 33-40 EURO/t) last year*
- *So, this business is an economically feasible*

BSF Co: Fuel consumption & productive employment

1. Tractor forwarding branches (Tractor with fork)

- Machinery costs 23 th EURO
- Productivity 0.9-1 ha/hour
- Fuel consumption 6.5-7.5 l/ha of diesel fuel
- Salary 43 UAH/hour (1.4 EURO/hour) - 1 worker

2. Manually fed chipping (Tractor with used chipper Heizohak 8-400)

- Machinery costs 27 th EURO
- Productivity 0.6-0.9 t/hour
- Fuel consumption 5.7 l/hour of diesel fuel
- Salary 43 UAH/hour (1.4 EURO/hour) - 1 worker
- 30 UAH/hour (1.0 EURO/hour) - 2 workers

3. Transportation of chips on local storage facility (tractor with trailer 11 cub. m)

- Machinery costs 26 th EURO
- Productivity 3.0 t/hour
- Fuel consumption 5.0 l/hour of diesel fuel
- Salary 43 UAH/hour (1.4 EURO/hour) - 1 worker
-

From 1 ha with 2.7 t of prunings with moisture content W49%, the farmer can obtain approximately **1.6 t of chips with W24%**



Future prospective and recommendations - How did partners transfer the results?

- The entrepreneur has seen that self-consumption model of the APPR biomass value chain is feasible and the large part of existing APPR biomass potential can be used for sale
- The company is going to start projects for switching of local boiler houses of the social objects (schools, kindergartens, etc.) on APPR biomass. It is ready to buy all necessary equipment and build the infrastructure for these purposes
- BSF Co is going to start projects for switching of local boiler houses on APPR biomass. It is ready to buy all necessary equipment and build the infrastructure for these purposes.



Take-off for sustainable supply of woody biomass from
agrarian pruning and plantation removal

Thank you very much for your attention!