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## Handbook for consultancy

Deliverable 4.2

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

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Prepared by: SECB


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	Company
<b>Author/s</b>	SECB
<b>Reviewers</b>	CIRCE
<b>Contributors</b>	CIRCE, CERTH, UCAB, UFG
<b>Task Leader</b>	UCAB
<b>WP Leader</b>	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”
TP	Technical Partners
UCAB	Association “Ukrainian Agribusiness Club”
UFG	University of Foggia
VC	Value chain
WP	Work Package

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## EXECUTIVE SUMMARY


Agricultural Pruning and Plantation Removal (APPR) biomass utilization for energy in Europe is very low as compared with wood coming from the forest. The *uP\_running* project goal is to set out the path in developing bioenergy value chains based on fruit, vines and olive tree residues obtained when performing APPR operations. One of the key parts of the project is developing training materials, including a handbook for consultancy, organizing and providing training courses for consultants who will make consultancy services for APPR biomass value chains initiatives.

This handbook with other *uP\_running* project materials and tools (training presentations, monographs, flagship success cases, observatory, templates, etc.) will provide a systematic knowledge how to make a consultancy service to create a new APPR value chain or improve existing one. Consultants can be assisted by four specific templates for APPR biomass diagnosis to collect structured information:

- 1) Assessment of APPR biomass potential;
- 2) Local biomass market;
- 3) Actors of a value chain;
- 4) Value chain operations.


Consultants can find a description of basic activities and links on the project materials for each phase of the APPR biomass value chain development. After training, consultants will reproduce part of the accompaniment performed in WP3 under the support of APs and TPs. This process of “learning by doing” will help them to be empowered to support or accompany new “pruning-to-energy” initiatives.



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# 1 INTRODUCTION

## 1.1 uP\_running as a tool for promoting energy use of APPR biomass

uP\_running project “Take-off for sustainable supply of woody biomass from agrarian pruning and plantation removal” aims **to unlock the European strong potential of woody biomass residues produced by Agrarian Pruning and Plantation Removals (APPR)** and to promote its sustainable use as an energy feedstock. uP\_running has been constructed with the ambition of being the prelude of a self-expansion of **APPR** wood utilization in Europe. Its vocation is to increase awareness of agrarian sector and energy sector, that this biomass can be an alternative source for energy, and to reduce a general skepticism, as regard of the technical difficulties and the occurrence of non-successful experiences. Therefore, it aims to firstly demonstrate and produce key tools, then convince the actors to be involved in **APPR** value chains, and finally expand **APPR** utilization through the involvement of multiple local actors in 7 EU countries: **Spain, Greece, Italy, Ukraine, Portugal, France, and Croatia**.



Figure 1. The general scheme of an APPR biomass value chain.

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## What is APPR?



Agrarian Prunings and Plantation Removal (APPR) refers to agricultural woody residues produced as a result of horticultural operations applied to vineyards, olive groves, and fruit plantations.

**Agrarian Pruning:** operations carried out annually, biennially, or every several years. Its targets may be diverse: prepare the tree shape according to the preferred conduction system of branches, to maintain tree size (structural pruning, topping), promote an appropriate shadowing for the fruit, or to increase the production of fruits with the larger size, among others.

**Plantation Removals:** operations of restoring the field to an initial stage for starting a new crop cycle. Trees are usually up-rooted with excavators and accumulated in piles, but they can also be felled and hauled outside the field. Roots are then obtained later through an up-rooting operation.

The utilization of agro-residues as a source of biomass is an opportunity for supporting the expansion of the bioeconomy in Europe. Among the multiple agro-residues, those produced from vineyards, olive groves, and fruit plantations represent a significant potential for many EU countries. According to several sources<sup>1,2</sup>, the **potential of APPR wood in Europe can reach 40 Mt (fresh biomass) per year**. Currently, the main management of the wood from APPR is its open-air burning, its disposal at field side where it is abandoned, or its use in form of shredded pieces widespread on the soil plantation.

Despite its general under-utilization, there exist successful cases of modern value chains at a local or regional level based totally or partially on APPR biomass. Till the end of May 2018, more than 20 cases have been identified by the *uP\_running* project and are recorded in the *uP\_running* “[Observatory](#)”, the web-based tool developed for recording APPR experiences.

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

According to the analysis of the current management of APPR residues<sup>1</sup>, it was observed that non-technical barriers are, in most of the cases, the reason for a scarce utilisation of wood from APPR in Europe. Among them to be quoted: the scarce awareness of agrarian sector and energy sector that this biomass can be an alternative source for energy, and a general skepticism, as regard of the technical difficulties and the occurrence of non-successful experiences. Moreover, the entrepreneurs usually have neither examples (models) nearby to replicate, nor wise advisor to solve their doubts or questions about APPR biomass.


For all these reasons, consultants trained in APPR biomass will be able to give valuable support for farmers, agrarian services company, cooperatives or another kind of companies that are interested

<sup>1</sup> EuroPruning FP7 Project, Branching out to new bioenergy supplies ([www.euopruning.eu](http://www.euopruning.eu))

<sup>2</sup> Biomass Futures, IEE Programme ([www.biomassfutures.eu](http://www.biomassfutures.eu))





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in starting, or participating in, new value chains based on this type of biomass. Solving them some questions, giving examples of success cases, putting them in contact with other stakeholders, etc. can be crucial for the entrepreneurs to be able to better understand the problematic and re-orientate their initiative.

### 1.3 Aims of the consultancy and the role of the consultant

The main aim of the consultancy is to support the entrepreneurs in solving doubts: visualising how so coherent is what they are thinking, avoiding early “death-track” models (leading to failure of initiatives), highlight next needed steps, etc. The accompaniment should serve them to gain knowledge, understand better the business they are facing, and obtain a series of items for the final decision making (biomass productivity, harvesting methods, quality issues, etc.).

Accordingly, 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).



Figure 2. Purpose of the uP\_running consultancy

### 1.4 How to use this Handbook


The Handbook for consultancy consists of 5 main parts and 8 annexes.

In Part 1, there is short information about the *uP\_running* initiative for promoting energy use of APPR biomass, aims of the consultancy and role of the consultant. It will be helpful for consultants to understand general approaches of *uP\_running* in the field of “pruning-to-energy”.

Part 2 provides necessary information about consultancy services for implementation of new APPR biomass value chains. The consultant must know basic information about *uP\_running* and consultancy services because entrepreneurs can ask about it during one to one contacts and meetings.

Part 3 describes a methodology for the consultancy. The consultant can use these materials as a systematic manual for his/her activities.



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Conclusions and recommendations are given in Part 4.

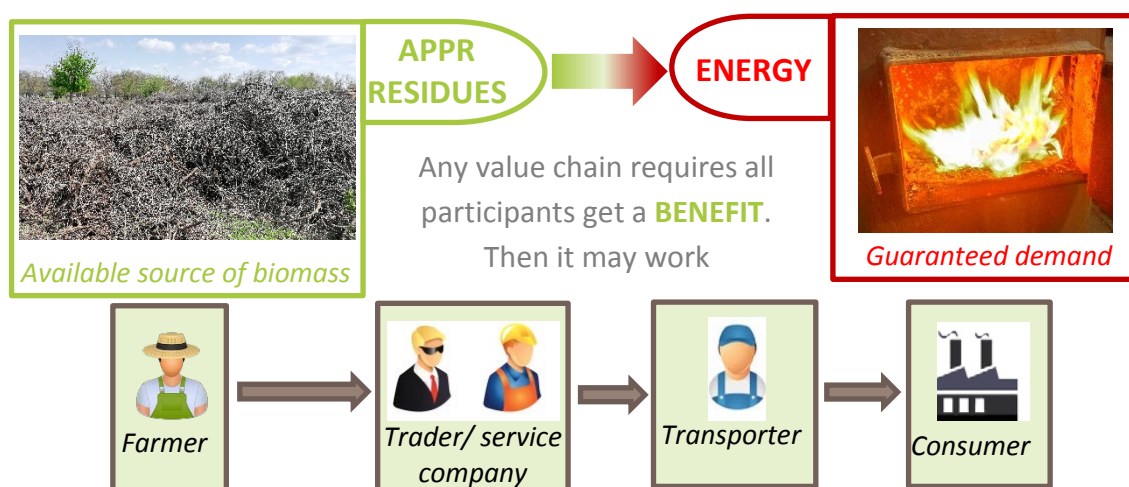
Finally, links and materials for each phase of the consultancy service can be found in Part 5.

In Annexes, there are templates for APPR biomass potential assessment, local biomass assessment, value chain actors, value chain operations, consistency check and final report; declaration of commitment and attendance sheet.

## 2 CONSULTANCY SERVICE FOR IMPLEMENTING NEW VALUE CHAINS BASED ON APPR BIOMASS

### 2.1 Background for consultancy service on APPR biomass

The stakeholder's decision on bioenergy projects development starts from understanding the link between an available source of biomass and an existing demand for energy (Fig. 3). APPR biomass producers can be farmers and agrarian cooperatives or companies that own fruit, olive or grape plantations. These value chain actors can provide with APPR biomass periodically (in case of prunings) or single-time (in case of plantation removals).




**CONSULTANT** may have to find answers to such 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 APPR biomass for energy is rational for initial conditions?
- What actors can be part of the APPR biomass value chain?
- What operations can be in the APPR biomass value chain?
- Is the project economically profitable?
- Etc.

Figure 3. Assessment of possibility to create an APPR value chain

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An APPR value chain may involve several kinds of actors; in most cases, however, it is initiated by one “**prime mover**”. The prime mover is usually the most active actor in the value chain, the one who engages the other and makes things happen. **Usually, the prime mover is also 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<sup>3</sup>.

Other important, general information for an APPR value chain are related to the **type of APPR biomass involved** (prunings, plantation removal or both), the **crop species used**, the **start date of the value chain** (as an indicator of its maturity) and also the **volume of APPR biomass mobilized annually** (as an indicator of its size).

The plantations are different and the amount of APPR woody biomass that can be obtained varies due to different factors (Fig. 4). In addition, biomass producers and other actors of APPR biomass value chains want to get benefits from their activities in a “pruning-to-energy” initiative. Consultancy service is a very important task for the development of the successful APPR biomass value chains despite the existing barriers. Information about best practices and key success factors regarding APPR biomass utilization is in the *uP\_running* report “Flagship success cases update v1”.

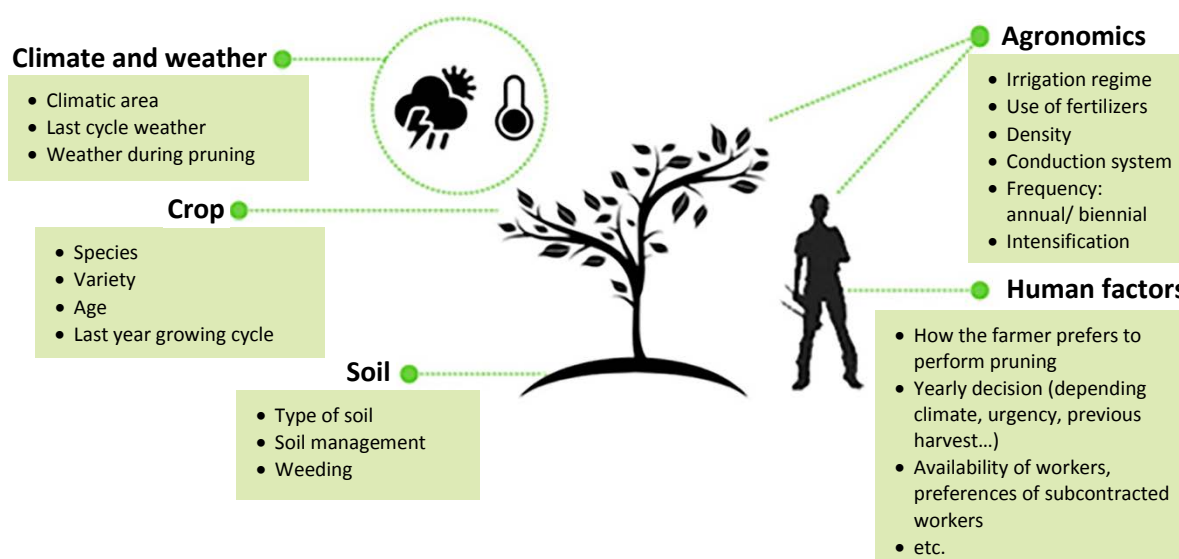



Figure 4. Principal factors influencing the amount of wood produced during the pruning operations<sup>4</sup>

From a process point of view, an APPR biomass value chain requires the implementation of a logistics chain that includes a series of steps, tailored to the specific requirements of the end use: harvesting and initial condition of APPR biomass from the field, a first haulage/transport, pre-

<sup>3</sup> [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)

<sup>4</sup> Figure has been adapted from EuroPruning Deliverable 3.1, p. 71, <http://www.europruning.eu/web/lists/pubfiles.aspx?type=pubdeliverables>

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treatment and storage, further processing (e.g. pelletization), transport to the end user and final energy conversion.

From the point of view of actors, APPR biomass value chains always start with one or more farmers, as suppliers of the raw material. Depending on the business model and the scale of the value chain, other actors may be involved: cooperatives that pool the resources of the members, agro-service companies that provide specific equipment and operations, energy service companies that perform a further processing of the biomass and can distribute it to end-users and biomass consumers / energy users that own the equipment for the final energy conversion (e.g. boilers, power plants, etc.).

The consultant should keep “open-minded” attitude and creativity for finding solutions in connection with the diverse initial conditions, the various interests of the stakeholders, the different model of use APPR biomass for energy (self-consumption, biomass to market, power production, etc. – for more information see Part 1 of the Consistency Check in Annex V).


A trained consultant can catalyse APPR biomass initiatives in specific regions. They can identify APPR biomass value chain actors and Prime Movers (PrMov), i.e., entrepreneurs eager to start a new value chain. For these activities, the consultant must be ready for direct contacts and meetings with different peoples who can give necessary information for the developing APPR biomass projects. Knowledge of consultants, supported by *uP\_running* partners, must help them to find successful decisions or solutions. They may have to 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.

The present handbook for consultancy gives the systematic basis of information about these aspects, but only practice will help a consultant to become an expert in APPR biomass.

#### **MATERIALS RELATED**

Material	Short Description
<b>Flagship success cases update (first release)</b>	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: <a href="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</a> <b>Error! Referencia de hipervínculo no válida.</b>
<b>Presentations 1</b> of the training materials	Main highlights and issues for energy use of APPR biomass
<b>ANNEX V</b> “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



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## 2.2 Implementation of new APPR value chains and potential consultancy activities

From a general point of view, the creation of an economically and ecologically feasible APPR value chain can be organized in a sequence of six stages in four phases, as depicted in Fig. 5. Between 1st-5th stages, there are feedbacks that are helpful for clarification of necessary data and the development of an efficient APPR biomass VC model in phases I to III.

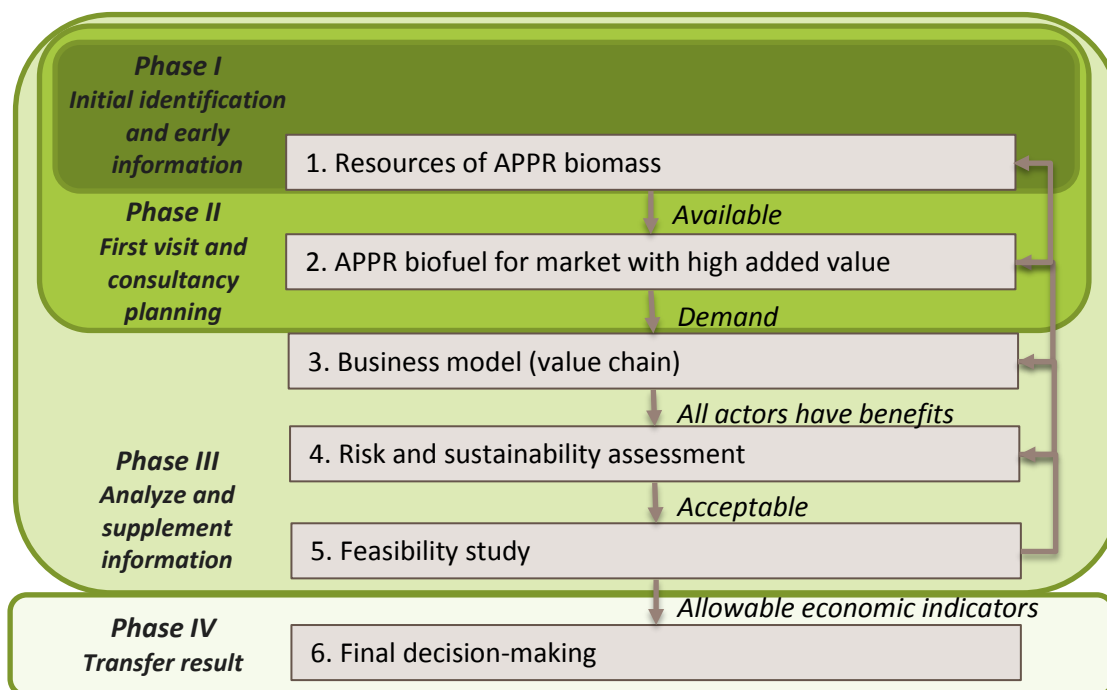




Figure 5. Phases and stages for the implementation of a new value chain based on APPR biomass.

According to the entrepreneur profile (e.g., if he/she is the APPR producer or consumer) and its particular needs and priorities in view of initiating the value chain, the activities to be carried out by the consultant may differ. In addition, the previous knowledge and background of the consultant, as well as the potential links between consultant and entrepreneur (e.g., if the entrepreneur is a member of the agrarian association where the consultant works), will also orientate the final consultancy activities to be performed. For all these reasons, the consultancy has to be tailored made to the specific needs and value chain type of each entrepreneur.



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

- Some may require some knowledge transfer and recommendations (e.g., biomass quality issues).
- Some others just do not know how to organize the info to have a clear scope of what decision should be made.
- 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.

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## MATERIALS RELATED

Material	Short Description
<b>Presentations 2</b> of the training materials	Methodology for Consultancy

## 2.3 Outputs of the consultancy

The final report of the consultancy services will create a basis for APPR biomass value chain development. The beneficiaries of the consultancy are stakeholders who can start (or participate in) a new business on APPR biomass initiatives. The consultants will help them to start doing actions from the conceptual idea taking into account the existing local conditions and stakeholders' capabilities towards APPR biomass project realization.

Local communities will also receive many positive results from the implementation of the APPR biomass for energy initiatives such as energy diversification, new job creation, a decrease of CO<sub>2</sub> emission, regional investments, etc.

## 3 METHODOLOGY FOR THE CONSULTANCY

The *uP\_running* team has developed a methodology and training materials for consultants. These will help the consultants to support entrepreneurs in one or several of the stages needed for the creation of new APPR value chains or improvement of existing ones.

To do so, we propose to perform the consultancy in four main phases:


- I. Initial identification and early information
- II. First visit and consultancy planning
- III. Analyse and supplement information
- IV. Transfer result

During the 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.

Then during the 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.



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Finally, in the PHASE IV the consultant will prepare a simple report about the consultancy services and will transfer results to the entrepreneur.

### 3.1 PHASE I. Initial identification and early information

In PHASE I the consultants will find APPR biomass producers and other potential value chain actors, who can be interested in new “pruning-to-energy” initiatives. For these activities, the consultant should contact potential value chain actors and, finally, select one or several of the readiest stakeholders for receiving the consultancy service.

#### **OBJECTIVE**

The main goal of Phase I consists in finding the potential entrepreneurs and getting 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.).

#### **HOW TO PROCEED?**

To begin, the consultant can find a list of stakeholders with contact information from the local farmer associations, data basis, municipality, business association, etc. After the first round of phone callings or emails, the consultant will be able to identify the stakeholders for APPR biomass value chains.

It may be helpful to 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.


To interact with the most interesting entrepreneurs, better know them and become reliable: 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.

The second round of contacts and meetings, including the first visit, will be performed with the remaining most promising entrepreneurs, so as to engage them and offer formally the consultancy service. It is strongly recommended that those entrepreneurs who do not show a real interest in the consultancy services are discarded in an earlier stage of next round, to avoid the consultants overworking.

Finally, the consultant will 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. For that aim, he/she may ask for the TP support (who can use geographical tools, data basis or other).





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## 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

For this first round of contacts with APPR biomass producers, the consultant can use the templates for assessment of APPR biomass potential (Annex I) to collect necessary data. Later in Phases II or III, the consultant can revise the assessment of APPR biomass potential by taking a new and more accurate data.

## MATERIALS RELATED

Material	Short Description
<b>ANNEX I</b> “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

## 3.2 PHASE II. First visit and consultancy planning

In PHASE II, 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.

### 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.

### HOW TO PROCEED?


Firstly, the consultant organizes the meeting, with AP support. There, he/she presents himself/herself, as well as the project and purpose of the visit.

Then, the most important issues are to 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 is he/she 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?
- Etc.





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Next, the consultant presents the type of services/activities he/she may offer to the entrepreneurs, having in mind the needs and gaps of the entrepreneur's initiative.

Note that AP accompanies the consultant for the first visit, to help him/her with technical and organizational issues, if needed, and to reinforce their reliability and experience on APPR. Moreover, TP is at the reach of the consultant for solving any questions or doubts.

For confirmation of commitment for the consultancy services, the template for Declaration of commitment (Annex VII) can be used. This form should be signed in two copies, one for the entrepreneur and one for the consultant.

### **OUTPUT**

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**

Prior to contacting, it is crucial that the consultant has a look at the data to be collected during the first visit. For that aim, Part 1 of the Consistency Check (Annex V) may be very useful 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).


Note that all objectives and information cannot be achieved in a sole meeting. On the other hand, the complexity, nearness, trust and capacities of each entrepreneur is different. Therefore, the contact strategy may be different.

According to the information to be transferred, identify how to proceed, as for example an initial email with Presentation letter, a phone call to discuss and prepared the meeting, 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 the company/association/organization who is actually able to take the decisions (company manager/director or similar) is present in the meeting. Otherwise, technical staff may not have the general overview of the initiative, the related risks, challenges, etc. The best option is to invite both profiles at the meeting so that both management and technical issues may be discussed and solved.

After this first visit, the consultant will analyze the information gathered and supplement missing or disputed information. For confirmation of a visit/meeting and collection basic data about participants (including contacts) the consultant can use the attendance sheet (Annex VIII).



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## MATERIALS RELATED

Material	Short Description
<b>ANNEX I</b> “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
<b>ANNEX II</b> “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
<b>ANNEX V</b> “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
<b>ANNEX VIII</b> “Attendance sheet”	This sheet will be helpful for confirmation of a visit/meeting and collection basic data about participants

## 3.3 PHASE III. Analyze and supplement of information

### OBJECTIVE


The main objective of the third Phase consists in analysing the information gathered previously, providing documentation<sup>5</sup> to the entrepreneur and, finally, solving the main doubts or questions of the entrepreneur has regarding a possible value chain implementation (or participation).

Depending on the needs identified in the previous phases, the supported actions agreed with the entrepreneur may differ. In this section, we present a non-exhaustive list of activities mainly demanded by entrepreneurs eager to start an APPR initiative. Accordingly, the consultant may directly read the section(s) of interest, in the view of the type of questions he/she has 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 CO<sub>2</sub> do I save thanks to my APPR initiative? Can I use residues from pruning or should I let them on soil? → 3.3.5.1 Sustainability assessment

<sup>5</sup> The materials (pdf documents, videos, power point presentations, etc.) indicated in this Handbook can be either: 1) used by consultants themselves and/or 2) provided by consultants to entrepreneurs. These are public materials, available in English and, in some cases, local languages.



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- Is the initiative feasible? What is the payback period for the new investment? → 3.3.5.2 Feasibility study

### 3.3.1 Field data gathering

Very often APPR biomass producers do not know how much biomass they can take from their plantations. In this case, the consultant should make an estimation about the APPR biomass potential based on the local characteristics of the plantations (e.g. tree species, variety – in particular, if it is vigorous – pruning frequency, etc.). Many examples of field measurements from different European countries can be found on the observatory map of biomass from agrarian pruning and plantation removal (available at [www.up-running-observatory.eu](http://www.up-running-observatory.eu)). If it is necessary to obtain more precise data the consultant can organize field measurement in stakeholders' plantations. Results of the measurements (amount of prunings/plantation removed, in t/ha) must be written in the Template for the field sampling of prunings or plantation removal respectively (available on the Observatory website at: [http://www.up-running-observatory.eu/en/Useful\\_documents](http://www.up-running-observatory.eu/en/Useful_documents)) along with some additional information that can be useful (fields' condition, crops, agrarian practices, etc.). Although the Template seems large, questions can be easily answered by the field owner.

The guidelines “Manual for field measurements on APPR biomass productivity”<sup>6</sup> provides detailed information how to perform measurements of the wood produced per hectare in vineyards, olive and fruit plantations, *i.e.*, the biomass productivity also called biomass yield or biomass potential. The methods are valid for both pruning and plantation removal wood.

The 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.

To choose the measurement method, the consultant should take into account external circumstances, required time and necessary materials. The information about the weighting of the APPR biomass and estimated time is given in Table 1.

Table 1. Estimated time for 2 persons performing the weighting of biomass in a fruit tree plantation<sup>6</sup>.

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

<sup>6</sup> [http://www.up-running-observatory.eu/file\\_uploads/8\\_en\\_uP\\_running\\_guidelines\\_for\\_field\\_sampling\\_EN.pdf](http://www.up-running-observatory.eu/file_uploads/8_en_uP_running_guidelines_for_field_sampling_EN.pdf)

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Weighted biomass contains some amount of water (moisture content), especially if the weighting of biomass is carried out the same day or a few days after the operations of pruning or plantation removal. It is advisable to carry out a measurement of biomass moisture content in accordance with the manual for field measurements.

The field data will be useful to complete the template for assessment of APPR biomass potential (Annex I).

### **MATERIALS RELATED**

Material	Short Description
<b>ANNEX I</b> “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
<b>Manual for field measurements on APPR biomass productivity</b>	The detailed information about each step of field measurements on APPR biomass productivity is given in the manual Available at: <a href="http://www.up-running-observatory.eu/file_uploads/8_en_uP_running_guidelines_for_field_sampling_EN.pdf">http://www.up-running-observatory.eu/file_uploads/8_en_uP_running_guidelines_for_field_sampling_EN.pdf</a>
<b>Template for Field Sampling of Pruning</b>	This questionnaire will help to take data for field sampling prunings Available at: <a href="http://www.up-running-observatory.eu/file_uploads/2_en_Template_for_Field_Sampling_of_Prunings.pdf">http://www.up-running-observatory.eu/file_uploads/2_en_Template_for_Field_Sampling_of_Prunings.pdf</a>
<b>Template for Field Sampling of Plantation Removal</b>	This questionnaire will help to take data for field sampling plantation removal Available at: <a href="http://www.up-running-observatory.eu/file_uploads/3_en_Template_for_Field_Sampling_of_Plantation_Removal.pdf">http://www.up-running-observatory.eu/file_uploads/3_en_Template_for_Field_Sampling_of_Plantation_Removal.pdf</a>

### **3.3.2 APPR biomass quality and market value**


APPR biomass quality and its market value have a great importance for the APPR biomass value chain. In other side, fuel specifications of APPR biomass prior to energy conversion are influenced by the implementation and the technical steps adopted for the logistics operation; the limitations of the energy conversion equipment have also to be taken into account. The template for the local biomass market (Annex II) will help the consultant to systematize received information.

The following parameters are considered for describing this aspect of a value chain<sup>7</sup>:

- **The form of APPR biomass prior to exploitation.** The following categories are considered: bales of branches, wood chips, hog (or shredded fuel), pellets and other types if applicable.
- **The maximum moisture content** (% as received). The maximum allowable water content depends on the specifications of the energy conversion system. Lower moisture increases

<sup>7</sup> [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)



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the heating value and the performance of the combustion system. The moisture content can be controlled to some extent by integrating natural drying steps in the logistics chain: for example, leaving the material on the field for some time before collection or drying of piles of branches. Such operation can bring the moisture content down to 20 – 25 %. In cases where lower moisture content is required, artificial drying steps have to be implemented. This is always the case in pellet production, where the process itself and the end product specifications require moisture content below 10 % on an as received basis.

- **The maximum ash content (% dry basis).** Again, this parameter is greatly influenced by the specifications of the energy conversion system. The larger the scale, the more tolerant a boiler used to be in terms of the maximum ash content, provided it is known in its design and appropriate measures to control dust emissions are implemented. The ash content of woody APPR biomass is generally higher than that of forest biomass, but some measures to reduce the ash content can be adopted during the design of the logistics chain, e.g., by avoiding operations that result in soil or stones intrusion.
- **The minimum low heating value (kJ/kg as received).** This parameter usually falls under specific ranges depending on the moisture and ash content of the wood biomass, but it is often listed as an important technical parameter for the operation of a conversion system or an economic parameter for the fuel sourcing.


In general, APPR from the vineyard, olive groves, and fruit trees are a woody biomass with good energy content, but with some particular differences in comparison to forest biomass (Table 2).

Table 2. Characteristics of different types of APPR biomass after mechanical collection (by harvesting with integrated shredder) and processing<sup>8</sup>.

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

When the quality characteristics of the fuel are totally unknown, the evaluation of certain basic properties, like moisture and ash contents, as well as particle size distribution is necessary in order to look for an appropriate potential consumer. For preliminary APPR biomass quality assessment the Deliverable 3.3 “Quality classification of the solid biofuels to be considered in the biofuels extended BIOMASUD label” of Biomass Plus project can be used (available at [http://biomasudplus.eu/en\\_GB/downloads/](http://biomasudplus.eu/en_GB/downloads/)). If it is necessary to determine more precise data, the consultant can take samples of biomass from a field and make an assessment of its quality using

<sup>8</sup> Monograph “Biomass from APPR: a feasible practice”

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Guidelines on “Biomass Quality and Market Value” developed by the *uP\_running* project. This guideline also contains information on the definition of APPR biomass market value. The main output of the consultancy is the possible price that final consumers can pay for such biomass. It should also be noted that biomass can be processed into several trade forms of solid biofuels (e.g. hog fuel, chips, pellets, briquettes). Defining of a high added value form of APPR biomass is the key factor of the value chain success.

#### **MATERIALS RELATED**

Material	Short Description
<b>ANNEX II</b> “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
<b>Guidelines</b> “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
<b>Monograph</b> “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
<b>Flagship success cases update (first release)</b>	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: <a href="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</a>


### **3.3.3 Development of APPR biomass value chain**

When the consultant finds out that within some territory there is a definite potential of APPR biomass that can be transformed into solid biofuel with high market value, he/she can go to the next stages of the APPR value chain development.

Firstly, value chain operations are determined. The template for value chain operations (Annex IV) will help the consultant to collect necessary information on potential operations needed from the field to the energy unit (e.g., a biomass boiler). The consultant can also use the Consistency Check (Annex V) for value chain organization, in order to review the organization of the logistics chain, if the operations carried out are logical, or if any potential step in the value chain has been disregarded.

Then, actors who can participate in the APPR biomass value chain must be identified. For this purpose, the consultant can use the template for actors of a value chain (Annex III). Particularly,



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the consultant will need to check who is or who can be the specific actor for each operation, and which type of gain, profit or reason will he/she obtain by participating in the value chain.

The order of these tasks can be changed depending on the potential needs of the entrepreneur.

### 3.3.3.1 Value chain operations

In order to have an overview of the proposed initiative, at first, the consultant will define the operations that may be needed in each step of the value chain. As each value chain varies from each other, it is difficult to examine each combination of different operations. In this light, a general scheme of a group of operations is depicted in Fig. 6 and based on these operations, the feasibility of the value chain based on the actor/activity may be defined later on (see section 3.3.5.2).

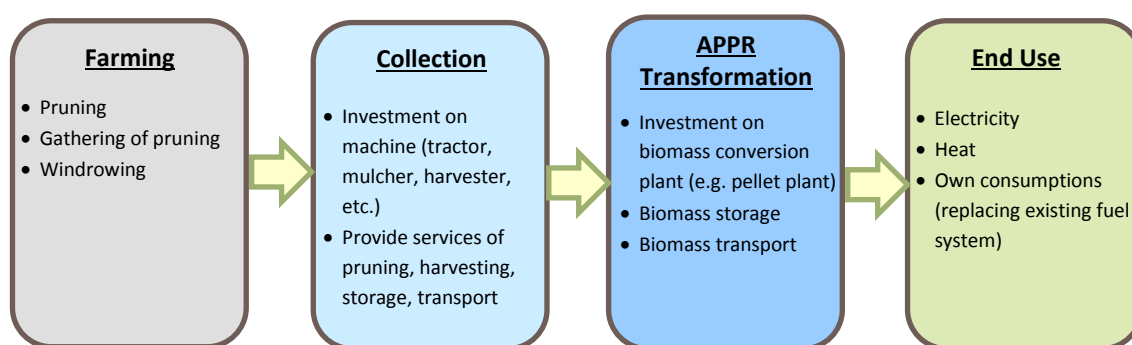


Figure 6. Group of operations that take place in an APPR Value Chain.

#### • Farming

One category of operations that can be clearly identified in any APPR value chain is that of the Farming activities. Farmers are the starting point of each APPR value chain. The activities of this category along with the corresponding costs can be pruning, a collection of pruning, windrowing, etc. The time and costs associated with these operations may be compared to costs of current pruning management, i.e., mulching and incorporation into soil or transfer and burning in open fire.

#### • Collection


The second group of operations that can take place in an APPR value chain is that of the Collection activities that include contractors of harvesting machinery, agro-cooperatives or agro-service companies that mainly deal with the treatment, collection, and transport of APPR from the field. Several costs are usually attributed to this group of activities like 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 and logistic costs.

#### • APPR transformation

The APPR transformation group involves actors that receive the APPR biomass from previous steps and produce an “upgraded” fuel that can be sold in the market or forwarded to other end-users for the final transformation to energy products such as heat and/or electricity. The typical example of an actor in the APPR transformation group is a pellet plant, but it can also be a case of a plant that is receiving branches or uprooted trees and produces wood chips in a centralized location.





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For these activities, the main costs that used to be considered are the investment costs for the APPR upgrade process (e.g. static chippers, dryers, pellet presses, etc.) and the operational costs (e.g. consumption of fuels for drying, electricity consumption, wages of personnel, etc.).

The income of an APPR transformer is generated from selling the upgraded fuel to the market or to specific end-user(s). 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.

#### • End use

The final stage of an APPR value chain is that of the market or end use of the final form of the treated biomass. The typical cases are when APPR biomass is used to produce heat, electricity or both (co-generation). Usually, the case of electricity or co-generation implies a specific end-user with particular requests. For the case of APPR biomass for heat, the end-user could also be specific (e.g. a greenhouse, a boiler in a winery, etc.) or the domestic market for biomass fuels, which consists of numerous small-scale end-users.

For this group of operations, the main costs that used to be considered are the 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.), 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.) and the operational costs for the APPR final energy production process.

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.

In this sector, it is defined how the APPR is exploited at its end-phase. It is highlighted whether the APPR or part of it is used for self-consumption or sold as fuel in the market (B2M). Various selling prices of the final product can be examined and conclude for which the value chain is most viable.


#### 3.3.3.2 Value chain actors

The producer of the residue (that is a farmer, a cooperative, a company producing fruit/olive/grape) deals with a change in the current method to perform the crop agronomics of residues management and its timing. This change is not always easy and requires a coordination with the other value chain actors downstream. On the other side, the value chain actors like biomass suppliers, managers of residues, or other intermediaries, are usually unaware of the needs of farmers and companies, and see the APPR biomass as a market product, without considering the effort needed downstream to drive the change in the residues management.

Therefore, even if there are multiple barriers and difficulties retaining the take-off in the use of these agro-biomass woody residues, the **first issue to address is to find a way to modify the current management of the residue in a way that is beneficial for all the value chain actors**, from farmer





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to consumer. The dialogue and mutual understanding are precise, especially where a new value chain is still not established. This fact is remarked in Fig. 7, where the key roles of the different value chain participants are specified. More detailed information about the development of APPR value chains and technical operations are in the monograph “Biomass from APPR: a feasible practice” promoted by uP\_running.

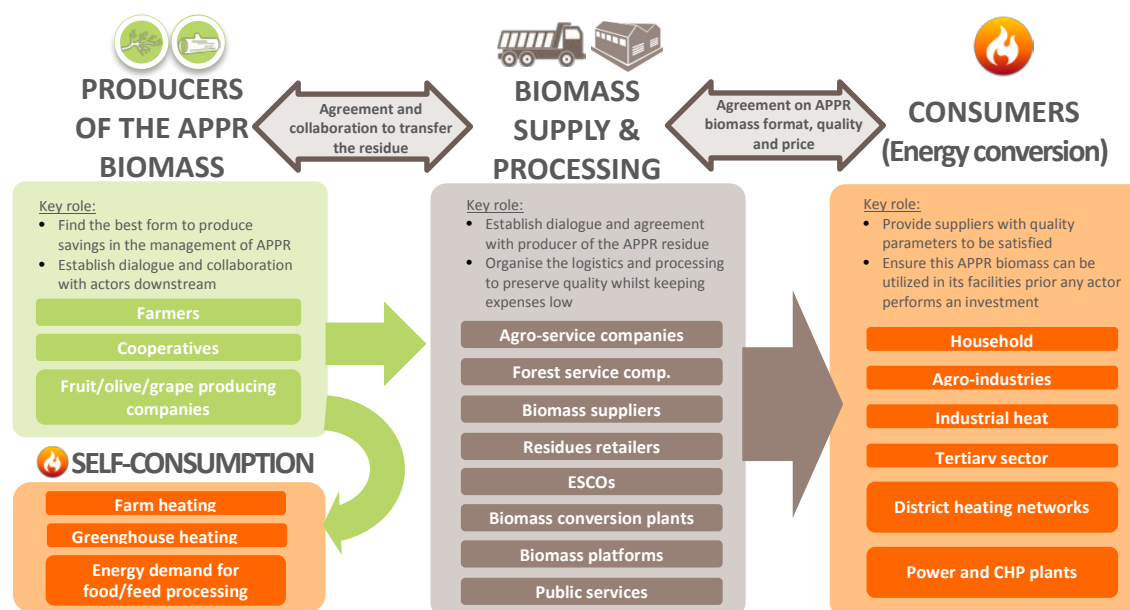


Figure 7. The three groups of key actors participating in the APPR biomass value chain: types of actors, interrelations and main roles<sup>9</sup>.

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


1. Tangible, as for example: incomes, savings or time saved
2. Intangible, as for example: avoid pest risk, avoid fire risk, reduce CO<sub>2</sub>, the image of sustainable business, make a value chain actor's company different, independence from fossil fuels, etc.

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

### 3.3.3.3 Some remarks about economics in an APPR value chain

It should be noted that in a particular APPR value chain, some of the economic roles can be performed by a single actor. For example, it may be a single farmer that decides to invest in harvesting equipment (hence acting as contractor in collection operations), a small-scale pellet press (hence acting as transformer in transformation operations) and a new boiler (hence acting as

<sup>9</sup> Monograph “Biomass from APPR: a feasible practice”


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end-user) in order to switch the heating fuel from oil or another type of biomass to APPR. Another example is a farmer that takes on the role of contractor and invests in harvesting machines for himself and sells the biomass to a pellet plant. Examples of different value chains can be found in the *uP\_running* Observatory, monographs, flagships success cases update (first and second releases) and presentation 1 “Main highlights and issues for energy use of APPR biomass” of the training materials. The description of costs, income, and savings in APPR VC are given in Table 3.

Table 3. 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 pruning, 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.

It should be noted that APPR biomass value chains can vary different from each other. No APPR biomass value chain initiative can be fully standardized; its evolving nature and its complexity mean that it can only be understood in full through a narrative description drafted after discussions and interviews with its “prime mover” and other involved actors. Some aspects of the value chain, such as the specifics of the logistics formulation (e.g., types of machines used) have also not been considered as part of the APPR value chain template. Both would complicate the creation of a standardized template and would go beyond the technical capacities of an Observatory-type tool; however, an extended description of such aspects is precisely the target of the *uP\_running*.


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## MATERIALS RELATED

Material	Short Description
<b>ANNEX III</b> “Template for value chain actors”	This template will be helpful to get information about the APPR biomass VC actors
<b>ANNEX IV</b> “Template for value chain operations”	This template can be used to find out the APPR biomass VC operations
<b>Monograph</b> “Biomass from agricultural pruning and plantation removals: a feasible practice promoted by uP_running”	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
<b>Flagship success cases update (first release)</b>	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: <a href="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</a>
<b>Template for APPR Value Chains</b>	This questionnaire will help to take data for Value Chains-Prunings and Plantation Removal Available at: <a href="http://www.up-running-observatory.eu/file_uploads/9_en_Template%20for%20APPR%20Value%20Chains.pdf">http://www.up-running-observatory.eu/file_uploads/9_en_Template%20for%20APPR%20Value%20Chains.pdf</a>
<b>Presentations 1</b> of the training materials	Main highlights and issues for energy use of APPR biomass

### 3.3.4 Risk assessment of the APPR biomass project

During and after the development of APPR biomass value chain, it may be interesting to provide a risk assessment in order to plan next steps for APPR project implementation. The SWOT analysis will intend to widen the view, detect external threats or opportunities and underline the main strengths and weakness of the entrepreneur and other actors. A template for SWOT analysis with some examples is shown in Fig. 8.

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

Figure 8. Matrix for the SWOT analysis of the APPR biomass value chain.

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
<b>Guidelines for business model definition and risk assessment</b>	These guidelines will helpful for risk assessment of developed APPR biomass VC


### 3.3.5 Next steps for APPR biomass project development

#### 3.3.5.1 Sustainability assessment

According to the 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, the consultant may use two different documents developed by the *uP\_running* project:



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- The “Guidelines for sustainability assessment” and the related Excel file. Through this tool, GHG emissions from the APPR value chain are calculated as **CO<sub>2</sub> equivalent emissions** ⇒ This may be useful in case an entrepreneur is interested in knowing the CO<sub>2</sub> 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.

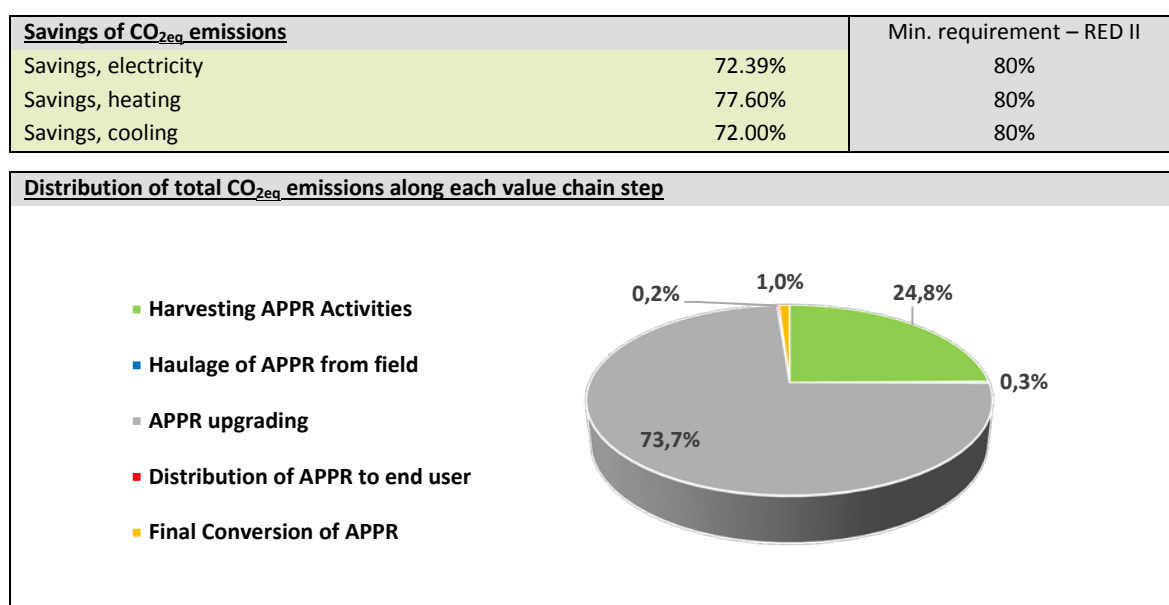


Figure 9. Outputs from the Excel template to assess the CO<sub>2</sub> equivalent emissions of a determined APPR value chain.

- 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. Following the method described in this document, the consultant 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. In Table 4, indicators used to assess if removing pruning from soil is sustainable or not are indicated (SOC for the soil organic matter). For example: SOC = 3; Texture = 3; Soil Slope = 2; Climatic Condition = 1; ⇒ Average Score =  $(3+3+2+1)/4 = 2.25$ . The calculated average score corresponds to the “Yellow Light” concerning the use of pruning and requires the SOM combined strategy (see Table 5).


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Table 4. Soil quality indicators considered in the assessment procedure

SCORE	SOC (%)	TEXTURE (%)	SOIL SLOPE (%)	CLIMATIC CONDITION*
3	> 3.0	CLAY 10-30; And SILT < 50; And SAND < 50	< 5	> 30
2	1.5 - 3.0	CLAY 10-30; And SILT > 50; Or SAND > 50	5 - 20	20 - 30
1	< 1.5	CLAY < 10 Or CLAY > 30	> 20	< 20

\* De Martonne Annual Aridity Index


Table 5. Soil management strategies according to the average score assigned to soil conditions

AVERAGE SCORE	MANAGEMENT STRATEGIES
> 2.5	Soil conditions are good or even optimal. "Green Light" means the full possibility to remove pruning from the soil and address their use for energy purposes. Therefore, no specific adjustment is strictly needed to further improve the current applied soil management on condition that at least the SOM maintenance options are already implemented. Differently, SOM maintenance options should be implemented (see "SOM maintenance strategy" in Table 3.3 of the Guidelines).
≤ 2.5 > 1.5	Soil conditions are not optimal but still fairly good; surely not critical. "Yellow Light" means that pruning can be removed from the soil and addressed to energy purposes provided that specific management options are applied ("cross compliance"). These prescribed operations are a combination of at least three "SOM Increasing" and two "SOM Maintenance" options (see "SOM combined strategy" in Table 3.3 of the Guidelines).
≤ 1.5	Soil conditions are bad or very bad. "Red Light" means that there are no possibilities to remove pruning from the soil and address their use for energy purposes. Alternatively, a deep readjustment of current management practices is needed in order to establish better soil conditions with respect to SOM content. Therefore, soil conditions should be drastically enhanced by applying a set of SOM improving options aimed at SOM increasing as the only appropriate and mandatory set of options if pruning is to be removed from the soil. A regenerative management regime is therefore applied to the soil (see "SOM increasing strategy" in Table 3.3 of the Guidelines).

## MATERIALS RELATED

Material	Short Description
<b>Guidelines for sustainability assessment</b>	These guidelines show how to perform the environmental assessment in order to evaluate the environmental impact of the APPR value chain (CO <sub>2</sub> savings)
<b>Criteria for sustainable soil conditions to remove fruit tree residues</b>	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



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### 3.3.5.2 Feasibility study

If the developed APPR biomass value chain has confirmed its technical feasibility, the consultant can provide an economic study to the entrepreneur supported. The detailed information for this stage is given in the “Guidelines for the Feasibility Study of APPR VC” (see Materials related below), which is accompanied by an Excel file template.

These guidelines show how to perform a feasibility study in order to evaluate the economic performance of each APPR value chain. The consultants may follow this methodology so as to calculate some economic indicators such as Net Present Value (NPV), Internal Rate of Return (IRR) and payback period. The methodology also allows to evaluate economically the different activities of the APPR biomass value chain from the point of view of each economic actor that participates in. An example is provided in the next Figure.

#### Summary of Economic Parameters for each actor. Data automatically generated.

Actor Name (based on "Economic Parameters for APPR VC" sheet)	CAPEX (€)	OPEX (€/ year)	INCOME/SAVIN GS (€/year)	NPV (€)	IRR	PPB (years)
Contractor	42.000 €	5.860 €	55.500 €	421.157 €	174,10%	0,63
Transformer	1.170.000 €	124.000 €	400.000 €	1.407.126 €	23,00%	5,97
End User	10.000.000 €	1.825.500 €	4.000.000 €	10.135.166 €	20,82%	6,84
Farmer	- €	- €	15 €	141 €	#iNUM!	0,00

Figure 10. Example of outputs that the Excel template provides to assess the economic feasibility of an APPR value chain.

#### MATERIALS RELATED


Material	Short Description
<b>Guidelines for the Feasibility Study of APPR VC [in English]</b>	These guidelines show how to perform a feasibility study in order to evaluate the economic performance of APPR value chains

### 3.3.5.3 Further project development process

The entrepreneur, who is taken the consultancy service, could be interested in providing the whole process of the project development for the proposed APPR value chain and in its further implementation. Standard procedures of the biomass project development use the following steps<sup>10</sup>:

- 1) Project idea;
- 2) Pre-feasibility study;
- 3) Feasibility study;

<sup>10</sup> [https://www.ifc.org/wps/wcm/connect/7a1813bc-b6e8-4139-a7fc-cee8c5c61f64/BioMass\\_report\\_06+2017.pdf?MOD=AJPERES](https://www.ifc.org/wps/wcm/connect/7a1813bc-b6e8-4139-a7fc-cee8c5c61f64/BioMass_report_06+2017.pdf?MOD=AJPERES)

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#### 4) Contracts and financing.

A detailed description of these steps is beyond the scope of this handbook. But, consultant's groundwork can be used as a key part of the first and the second steps. The third step (the feasibility study) with a detailed assessment of all aspects of the project will follow the second one if the pre-feasibility study shows that the project is economically sound. The contracts and financing step takes the project from the feasibility study to the final investment decision. The complete procedure of the project development is a challenging task and the consultant should only do a diagnosis of the APPR biomass value chain.

But, the consultant should be ready that some questions and requested information (even from the very beginning of the consultancy activity) could be as following:

- What are the possible financing conditions to be expected by the capital investment of the project?
- Is the project feasible from the technical point of view? Is it economically profitable? How much?
- Are the bankability conditions of the project fully met?
- Do you know the best plant installer in the region/country? Who is the most advisable engineer to be hired in preparing the project?
- What are the subsidies that the investing company can obtain in this kind of activity? Similarly, are there any kind of tax credit, financial concessions, preferential discount rates, etc. to be foreseen?
- Is the permitting procedure long and cumbersome? Does it need a lot of money just to be started? Are you sure that after 2-3 years of waiting, I will reach the goal and they will grant me the license to build?
- Are you sure that no social conflict or ecologist protest will be the target of the bioenergy project? Are there any kind of NIMBY syndrome to be tackled?

The answers to these questions mainly depend on the experience and knowledge of the consultants, features of the country, legislation, local conditions, etc.

### 3.4 PHASE IV. Transfer result


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





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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
<b>ANNEX VI</b> “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”)

## **4 CONCLUSIONS AND RECOMMENDATIONS**

APPR biomass remains underdeveloped in Europe despite the existing potential. The *uP\_running* project has been developed with the ambition of being the prelude of a self-expansion of APPR wood utilization for energy. The project incorporates a set of straight actions aimed to reshape the sector perception, to provide evidence of real success and replicable models to follow, as well as to promote the take-off for the utilisation of APPR biomass residues.

Because of the APPR biomass features, its value chain has different variants of realization and not always feasible. There is no standard solution or model for all APPR value chains development. In that sense, the success of the APPR projects requires an individualized approach including the support of trained consultants and/or expert knowledge.


One of the *uP\_running* key actions is to prepare materials and organize a training course for consultants who will provide consultancy services to interested stakeholders for starting the commercialisation of APPR biomass for energy.

This handbook, together with other *uP\_running* project materials and tools (training presentations, monographs, flagship success cases, observatory, templates, etc.), will provide a systematic knowledge how to make a consultancy service to create a new APPR value chain or improve existing one. Consultants can learn how to organize consultancy services in four phases (I – initial information and early information; II – first visit and consultancy planning; III – analyse and supplement information; IV – transfer result), which data they must collect from stakeholders, how to analyse the received information and, finally, how to transfer results.

For developing of value chain based on APPR biomass, the consultants can use consistency check template, which is in Annex V. Moreover, annexes of the handbook include four other specific templates for APPR biomass diagnosis:

- 1) Assessment of APPR biomass potential;
- 2) Local biomass market;
- 3) Actors of a value chain;



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#### 4) Value chain operations.

The *uP\_running* continues generating new materials and specific information on different aspects of APPR biomass value chains development. Follow the project updates on the site <http://www.up-running.eu>.

## 5 ADDITIONAL LINKS AND MATERIALS

In addition to the Training Materials (available on the *uP\_running* website and presented during the training sessions), consultants can use additional sources of the information for their activities in the field of APPR biomass value chains.


#### YouTube

YouTube	Link	Short Description
Video "Demo in Spain"	url	Short description of contents
Video "Demo in Italy"	url	Short description of contents
Video "Demo in Greece"	url	Short description of contents
Video "Demo in Ukraine"	url	Short description of contents

#### Websites

Websites	Link	Short Description
uP_running	<a href="http://www.up-running.eu/">http://www.up-running.eu/</a>	<i>uP_running</i> project aims to unlock the European strong potential of woody biomass residues produced by Agrarian Pruning and Plantation Removals (APPR) and to promote its sustainable use as an energy feedstock.
uP_running observatory	<a href="http://www.up-running-observatory.eu/">http://www.up-running-observatory.eu/</a>	Observatory map of biomass from agrarian pruning and plantation removal
Europruning	<a href="http://www.europruning.eu/">http://www.europruning.eu/</a>	EuroPruning project aims to be the take-off for an extensive utilisation of the agricultural prunings for energy in Europe. The project aims to the development of new improved logistics for pruning residues. This includes harvesting, transport and storage for agricultural prunings (fruit tree, vineyards and olive grove prunings and branches from up-rooted trees).
BIOMASUD PLUS	<a href="http://biomasudplus.eu">http://biomasudplus.eu</a>	Developing the sustainable market of residential Mediterranean solid biofuels. The overall objective of this project is to develop integrated solutions to promote the sustainable market for Mediterranean solid biofuels for residential heating.



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## Presentations

Presentations	Link	Short Description
Training materials 1	url	Main highlights and issues for energy use of APPR biomass
Training materials 2	url	Methodology for Consultancy
Training materials 3	url	Training Case in Spain
Training materials 4	url	Training Case in Ukraine

## Others materials


Nº	Material	Source	Short Description
1	Monograph	url	The first <i>uP_running</i> monograph provides an insight to the status of use of APPR biomass, as well as an overview on the difficulties to start up new initiatives. More specifically, it describes the organization of the value chain operations: how the different stages of the value chain and logistics can be carried out, how to preserve the value and characteristic of the APPR biomass, and what should be regarded when facing its utilization to produce heat and/or electricity.
2	Flagship success cases	<a href="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</a>	D6.3: Flagship success cases update v1. Deliverable report D6.3. <i>uP_running</i> project H2020 691748
3	Manual for field measurements on APPR biomass productivity	<a href="http://www.up-running-observatory.eu/file_uploads/8_e_n_uP_running_guidelines_for_field_sampling_EN.pdf">http://www.up-running-observatory.eu/file_uploads/8_e_n_uP_running_guidelines_for_field_sampling_EN.pdf</a>	The detailed information about each step of field measurements on APPR biomass productivity is given in the manual
4	Guidelines for business model definition and risk assessment	url	Guidelines describe the Business Model Canvas and SWOT analysis methodologies
5	Guidelines for Sustainability Assessment	url	Guidelines describe the methodology for calculation some environmental indicators, the savings of GHG (CO <sub>2</sub> equivalent) emissions by implementing the new APPR value chain



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Nº	Material	Source	Short Description
6	Criteria for sustainable soil conditions to remove fruit tree residues	url	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
7	Guidelines for the Feasibility Study of APPR VC	url	Guidelines show how to perform a feasibility study in order to evaluate the economic performance of APPR value chains
8	Templates for Observatory	<a href="http://www.up-running-observatory.eu/file_uploads/2_en_Template%20for%20Field%20Sampling%20of%20Prunings.pdf">http://www.up-running-observatory.eu/file_uploads/2_en_Template%20for%20Field%20Sampling%20of%20Prunings.pdf</a>	Template for Field Sampling-Prunings.
		<a href="http://www.up-running-observatory.eu/file_uploads/3_en_Template%20for%20Field%20Sampling%20of%20Plantation%20Removal.pdf">http://www.up-running-observatory.eu/file_uploads/3_en_Template%20for%20Field%20Sampling%20of%20Plantation%20Removal.pdf</a>	Template for Field Sampling-Plantation Removal
		<a href="http://www.up-running-observatory.eu/file_uploads/10_en_uP_Running_WP6_questionnaire_mechanized_prunings_final_EN.pdf">http://www.up-running-observatory.eu/file_uploads/10_en_uP_Running_WP6_questionnaire_mechanized_prunings_final_EN.pdf</a>	Template for Mechanized Collection-Prunings
		<a href="http://www.up-running-observatory.eu/file_uploads/11_en_uP_Running_WP6_questionnaire_mechanized_plant_removal_final_EN.pdf">http://www.up-running-observatory.eu/file_uploads/11_en_uP_Running_WP6_questionnaire_mechanized_plant_removal_final_EN.pdf</a>	Template for Mechanized Collection-Plantation Removal
		<a href="http://www.up-running-observatory.eu/file_uploads/9_en_Template%20for%20APPR%20Value%20Chains.pdf">http://www.up-running-observatory.eu/file_uploads/9_en_Template%20for%20APPR%20Value%20Chains.pdf</a>	Template for Value Chains-Prunings and Plantation Removal




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## 6 ANNEXES

<b>Annex list</b>	<b>Title</b>
Annex I:	Template for assessment of APPR biomass potential
Annex II:	Template for local biomass market
Annex III:	Template for actors of a value chain
Annex IV:	Template for value chain operations
Annex V:	Consistency check template
Annex VI:	Template for the final report to entrepreneur
Annex VII:	Declaration of commitment and visit participant list
Annex VIII:	Attendance sheet



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## Annex I Template for APPR biomass potential assessment

Each template refers to one APPR producer, e.g., farmer, cooperative, fruit producer company, etc. The key objective is to explore APPR potential for energy purpose. Also, depending on the geographical areas and relations among stakeholders, several APPR producers can cooperate together to obtain a larger volume of APPR biomass. In the case of a large number of small farmers, the consultant can interview some of them, and then the questionnaire should be filled in using aggregate data for the area in focus.

**A.1** Specify information about the farmer and the location of his horticulture plantations.

**A.2** Choose a crop species and put the number for every species in order.

**A.3** For each plantation, indicate the number of species, variety of crop, area in hectares, age in years, type of APPR biomass (P – for prunings, R – for plantation removal or P/R – for both), frequency of pruning (annual, biannual, biennial, once per \_\_\_\_ years). Also, ask the farmer about possible APPR biomass quantity in t/ha and its moisture content (W) in %. If the farmer could not give such information the reference data is on the Observatory web-tool <http://www.up-running-observatory.eu> that was developed by the *uP\_running*. More information about the Observatory web-tool is on the tab “Instruction”.

**A.4** Mark months when biomass resource is produced for prunings or/and plantation removal.


**A.5** Ask the farmer about the usual practice for APPR biomass use. If he uses or sells biomass for firewood, indicate the minimum diameter of a branch for this purpose.

**A.6** Ask the farmer about volumes in tons of 4 types of APPR biomass for energy purposes (roots, stems, thick and thin branches. Find out what is the average share of firewood in total volume of APPR biomass. It is important to clarify whether there are other farmers nearby who produce such type of biomass and could be interested in participating in “pruning-to-energy” initiatives.

**A.7** Specify the farmer’s expectations of the “pruning-to-energy” initiatives. What benefits (tangible and intangible) he would like to receive?


**A.8** This is the field for the additional information, which the farmer would like to share regarding the APPR biomass potential. Also, ask the farmer about barriers that prevent him to start “pruning-to-energy” initiatives.

**Comments** At the end of the template, the consultant has to write a few comments about the contact with the farmer for the personal use. It will be useful to specify information about the farmer and his vision of the use of the APPR biomass and helpful for future contacts.

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<b>A.1 Farmer data and location of plantations</b>	Farmer (Company)											
	Name of the contact person											
	Contact information		Tel. _____ E-mail _____									
	Administrative territory (municipality)											
<b>A.2 Crop Species</b> (choose the crop species and put a number)		Olives		Apricot		Chestnuts						
		Peaches		Oranges		Pears						
		Cherries		Hazelnuts		Plum						
		Grapefruit		Apples		Lemons						
		Vineyards		Nectarines		Almonds						
		Other _____										
<b>A.3 Plantations Characteristics</b> (in the column "Type of APPR" use P – for prunings and R – for plantation removal)	Specie # /Variety	Age, years	Area, ha	Type of APPR	Frequency of pruning	Biomass output, t/ha (W, %)	TOTAL, t					
		TOTAL for pruning		X		X						
	TOTAL for removal		X		X							
<b>A.4 Month when biomass resource is produced</b>												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pruning												
Removal												
<b>A.5 Usual practice for the APPR biomass use</b> (check usual practice for each type of APPR)					Roots	Stems	Branches					
							thick	thin				
	Abandoned at a field side											
	Mulched as a soil cover											
	Firewood for diameter more than _____ cm											
	Burnt in fires at open air											
	Shredding and integration to soil											
Other _____												




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<b>A.6 Volumes of APPR biomass for energy purposes</b> <i>(specify APPR biomass potential in tons)</i>	Roots		Thick branches				
	Stems		Thin branches				
	Possible changes of volume						
	The average share of firewood in the total volume of APPR biomass						
	Other farmers nearby who have the APPR biomass						
<b>A.7 Entrepreneur expectations for “pruning-to-energy” initiatives</b> <i>(check as many as apply)</i>		Avoid fire risk					
		Reduce CO <sub>2</sub>					
		Reduction costs for APPR management					
		Use APPR biomass for self-consumption					
		Possible business build on own APPR biomass					
		Possible business build on services for local farmers					
		Profit from the processing of APPR biomass into solid biofuels					
		Creating a whole value chain and selling heat/energy					
		Other _____					
<b>A.8 Additional information</b>							
<b>COMMENTS</b> <i>(for personal use)</i>							





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## Annex II Template for local biomass market assessment

Each template refers to one respondent, who is knowledgeable about information on the biomass market in a certain territory with APPR biomass potential. Such information can be obtained from representatives of municipalities responsible for energy efficiency, sellers of biofuels, consumers of biofuels, heat/energy, local boiler installation companies, etc. The key objective is to find out an effective demand for APPR biomass. In addition, online trade platforms can be used to find out the actual fuel prices in the target region.

**B.1** Specify information about the respondent and his expertise in a local biomass market.

Further, the template consists of two sections: for fuel market and for biomass consumption.

**B.2** Describe the main fuels for heat and electricity production in the target region.

**B.3** Identify local solid biofuels producers and specify their annual volumes of production and actual biofuel prices.

**B.4** Identify local solid biofuels trading companies and specify their annual volume of sales and actual prices.

**B.5** Identify main local solid biofuels consumers.

**B.6** Ask fuel consumer about the fuel they currently use, its annual consumption and price.

**B.7** Choose what type of biomass/biofuels can be consumed by the company.


**B.8** Ask about the situation with required supply of biomass (enough or not, etc.) to the local market in the last few years.

**B.9** If the consumer can use biomass, find out about the quality requirements of the biomass to be burnt in their combustion system (max. content of moisture, max. content of ash, min. LHV, required biofuel particles size, etc.).

**B.10** Ask the respondent about his possibility to consume APPR biomass.


**B.11** Additional information obtained from the respondent about the present situation and trends at the local biomass market. Ask about a new bioenergy project that will be able to use APPR biomass.

**Comments** At the end of the survey consultants have to write comments about the possible final product and actors for APPR biomass value chain.


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<b>B.1 Respondent data</b>	Name				
	Profession/ Areas of expertise				
	Company (organization)				
	Type of company activity				
	Contact information		Tel. _____ E-mail _____		
	Administrative territory (municipality)				
<b>Section for fuel market</b>					
<b>B.2 Main fuels for heat and electricity production</b>	Type of fuel		Used unit	Average volume, unit/year	Price, EUR/unit
<b>B.3 Local solid biofuels producers</b>	Type of solid biofuel	Name of company	Place	Average volume, t/year	Price, EUR/t
<b>B.4 Local solid biofuels trading companies</b>	Type of solid biofuel	Name of company	Place	Average volume, t/year	Price, EUR/t
<b>B.5 Main local solid biofuels consumers</b>	Type of solid biofuel	Name of company	Place	Average volume, t/year	Price, EUR/t



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Section for biomass consumption			
<b>B.6 What is the fuel you currently use, its annual consumption and price?</b>			
<b>B.7 What type of biomass/biofuels can be consumed by the company?</b>			Wood chips
			Wood pellets
			Wood briquettes
			Firewood
			Other _____
<b>B.8 What was the situation with the required supply of biomass to the local market in the last few years?</b>			
<b>B.9 What are the quality requirements of the biomass to be burnt in your combustion system?</b>		Max. content of moisture, % weight	
		Max. content of ash, % weight, dry basis	
		Min. LHV, kJ/kg	
		Range of biofuel particles size, mm	
		Other _____	
<b>B.10 Could you consume APPR biomass and on what terms of supply?</b>			
<b>B.11 Additional information</b>			
<b>COMMENTS</b> <i>(for personal use)</i>			

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## Annex III Template for value chain actors

Each template refers to one respondent who can be an actor of APPR biomass value chain. There are three groups of key actors participating in the APPR value chain: producers of the APPR biomass; biomass supply & processing; consumers. The template in Annex I helps to identify producers of the APPR biomass – farmers, and the template in Annex II is for consumers and biofuel producers. The key objective of this template is to identify all actors in the value chain and define their functions to create new or improve existing APPR biomass value chain.

**C.1** Specify information about the respondent's company and expertise that can be used for the creation of the APPR biomass value chain.

**C.2** Choose an actor's possible role in the APPR value chain.

**C.3** Specify what resources (equipment, storage facilities, marketplace, boiler houses, etc) the potential actor has.


**C.4** Ask about needs of the potential actor.

**C.5** Ask about basic terms for cooperation in the APPR value chain.


**C.6** Additional information obtained from the respondent about his possible role in the APPR biomass value chain and existing resources (staff, machinery, storage facilities, marketing, boilers, etc.). Ask about economic and non-economic benefits that are necessary to involve him to be an actor of the APPR biomass value chain.

**Comments** At the end of the template consultants must write comments about the possible participation of the respondent's company (respondent) as an actor in the APPR biomass value chain. Also, it is important to find out a prime mover who will lead the creation of the APPR value chain.



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<b>C.1 Respondent data</b>	Name			
	Profession/ Areas of expertise			
	Company (organization)			
	Type of company's activity			
	Contact information	Tel. _____ E-mail _____		
	Administrative territory (municipality)			
<b>C.2 What is your possible role in the APPR value chain?</b>		APPR biomass producer		
		Collector		
		Logistics		
		Transformation		
		Trading		
		End use		
<b>C.3 What resources do you have?</b>				
<b>C.4 What do you need to operate in the APPR value chain?</b>				
<b>C.5 On what conditions will you agree to cooperate?</b>				
<b>C.6 Additional information</b>				
<b>COMMENTS</b> <i>(for personal use)</i>				

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## Annex IV Template for value chain operations

Each template refers to a prime mover of one possible value chain. The template is filled when the consultant has obtained the information about the APPR biomass resources, local market and actors of APPR value chain.

**D.1** Fill in the information about the prime mover of the APPR biomass value chain.

**D.2** Select the type of the APPR value chain.

**D.3** Specify basic operations of the APPR value chain and indicate the key actors, if already identified.


**D.4** Find out existing resources and machinery for every APPR value chain operation.

**D.5** Describe additional resources and machinery that may be necessary for every APPR value chain operation.

**D.6** Additional information obtained from the respondents about their resources for providing operations in an APPR biomass value chain. Ask about equipment, machinery, storage facility, transport, boilers, etc.


**Comments** At the end of the template consultants have to write comments about availability for each operation of the APPR value chain. Describe possible options for the APPR value chain.



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<b>D.1 Prime mover information</b>	Name		
	Profession/ Areas of expertise		
	Company (organization)		
	Type of company activity		
	Contact information	Tel. _____ E-mail _____	
	Administrative territory (municipality)		
<b>D.2 Type of the APPR value chain</b>		Self-consumption	
		Transformation into solid biofuels	
		Heat/energy production	
		Other _____	
<b>D.3 Basic operation of APPR value chain</b>	Operation	Actor	
	APPR biomass producing		
	Collecting		
	Logistics		
	Transformation		
	Trading		
	End use		
<b>D.4 Existing resources and machinery</b>			



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<b>D.5 Necessary additional resources and machinery</b>	
<b>D.6 Additional information</b>	
<b>COMMENTS</b> <i>(for personal use)</i>	



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## Annex V Consistency check template

### ABOUT THE CONSISTENCY CHECK (Ccheck)

#### Why a consistency check?

Make next thought: think on an area where APPR residues are not currently being utilized, and they are just disposed, burnt on open air, or shredded on the plantation soil. What is necessary to make possible that these APPR woody residues start being mobilized and utilized to produce heat or electricity?

Thinking about the Value Chain (VC) organization, we see two main issues:

1) It is necessary that the local farmers, cooperatives or industries that are performing the agronomic operations, get ready to change the mode they perform the management of their agricultural residues.

2) It is needed that somebody at the end of the VC finds a value and is ready to pay for the APPR biomass.

The VC will make sense only when all the actors involved find a benefit when participating in it. Otherwise, it is unfeasible.

The value of the final biomass is important to be ensured, and for this purpose, it is necessary that the operations along the VC contribute to keep such value (e.g. by avoiding contamination with soil, stones, etc.). The value the final user pays is a driving force for establishing the VC. This value they pay makes possible that the operations upstream take place, since some actors may get economic profits, or savings.

Not everything is money, and some actors in the VC may find other “intangible” values like saving time, avoid annoying operation for the residue management, or branding they are “green” and contributing to solve local problems (because they use local residues), etc.

About issue (1), it deals with a change in the mindset and the actors get ready to release, mobilize, or facilitate their residues, and is not the main issue for this document.

The present document concentrates in the issue (2): the VC organization, including the operations carried out at the farm to collect the APPR biomass.

#### How the present document must be utilized


The present document starts from the final consumers, their needs and their intention to pay for the APPR biomass (€/t). Afterwards the proposed VC is analyzed, item by item, to check if the proposed VC is “a priori” consistent, or if anything should be corrected or further reviewed.

Table V.1 shows the itinerary of the document.

The consultant should follow it and tick the boxes next by every item. When an item is not being addressed or is unclear, it fails (✗) and he/she is asked to include a corrective action.

Proposing corrective actions makes the consultant aware of what is still to be done, what is uncertain. Accordingly, it allows detecting the gaps that are still to be solved. Following the evaluation, the consultant would realize the maturity of the initiative, and will probably realize that some parts of the VC should be re-scoped, or that some operations were forgotten, or should be modified.



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*Table V.1 Itinerary of the Consistency Check presented in this document*

Step	Item	Objects to be checked
1	APPR utilisation model	a. Main items of the APPR model
2	APPR biomass value	a. Consumers profile b. Consumers value & interest c. Conformity of APPR biomass with consumer expectation
3	Bringing value to consumers	a. Logistic organisation b. Review of some critical items on quality
4	Added value to all stakeholders	a. Value chain actor gains and roles
5	Final consideration	a. Wrap-up of consistency check

## 1 APPR utilisation model

This section presents a description of different alternative organisations of the VC.

Choose the one most suitable for the PrMov, to understand what are the typical arrangement and key items.

In case the developed model differentiates from those described below, the consultant may review a combination of the models presented.


### Small introduction to APPR biomass value and market

APPR biomass as an alternative biomass for a consumer makes only sense when he/she finds an advantage. In terms of biomass or energy market, the advantage is principally the price (though other feature of the APPR biomass may be relevant in some cases). In general, if the APPR biomass is not competitive in respect other fuels (comparing €/unit of energy), the APPR VC will just fail: APPR may bring more difficulties and uncertainty to the consumer with respect gasoil, or with respect other biomass types. Then, the final consumer will not adopt the new APPR biomass, since he/she does not gain anything in compensation to all uncertainties.

This is a general rule, though in some cases the price per unit of energy is not so determinant. This may be the case of self-consumption (where the farmer or the cooperative has the opportunity to internalize the APPR costs) or public initiative (where there is an interest to promote a new management of the agrarian residues).

It also must be noted the intangible value that APPR biomass can have. For example, reducing the fire risk; reducing the local pollution in the time of year when people perform open fires; reducing the possibilities for a disease or pest establishment in fields; gain an image or sustainability; get the



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acknowledgment of company/council compromised with the local problems; etc. The intangible value should not be underestimated. In many of the existing VCs some of the actors were initially guided by non-tangible interests and ended up to find the new practices helped to lower their expenses in energy services.

### **Different forms to organise the VC for APPR biomass**

Here a small bunch of cases. Each case describes a type of model. The consultant should choose the one most similar to the PrMov initiative.

Each model incorporates a description, and some “items to be checked”. The idea is that the consultant, taking into account the PrMov’s interest, check if initially, and without exploring specific issues of the VC, there are evidences of a possible wrong scoping of the VC.

1. Collection of APPR biomass from own (or neighbour fields) for self-consumption
2. Collaborative gathering of biomass and self-consumption in cooperative
3. Gathering of APPR biomass for marketing woodchips / shredded wood
4. Gathering of APPR biomass for marketing APPR wood pellets
5. Gathering APPR biomass by an ESCO. Biomass is not commercialised, but the heat (the energy service)
6. Promotion of the APPR biomass by a council or a public authority

Next, each one of the models is described briefly.

### **1. APPR self-consumption**

#### Description:

An orchard owner decides to use the pruning wood for self-consumption. The biomass could be consumed for the household heating, or for some other farm facilities (heating of stables, greenhouses). Self-consumption reduces the risks but makes the entrepreneur charge with all responsibilities.

Some variants are available.


As function of the heating device:

- Stove or log fired boiler: based on logs from thick branches, involving the traditional work of gathering thick branches, preparing logs, and charge boiler in batches
- Woodchips/shredded wood: branches can be forwarded out of the field and then fed manually to a garden-like chipper, or with an integrated pruning harvester and chipper.

As function of the participation of other stakeholders in the VC:

- An external company offers pelleting service with a mobile system. Pellets produced are of low quality. However simplifies the compatibility of the heating system.
- An external company offers chipping.
- ESCO facilitates the heat, meaning they cover the investment in the boiler and the maintenance.



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#### Items to be checked:

- Think if the farmer can afford the new facility and machinery investment.
- Check the volume of biomass and if it can be stored.
- Consider the time and skills needed to treat biomass. Just to check if the farmer will have the capacity to perform them, or if he/she needs to subcontract some works.
- Note that APPR biomass can't be consumed in usual boilers. Just note that the farmer should have already contacted a facility provider with expertise in non-conventional biomass.

*If any of the previous items were not considered, the consultant may need to re-think his/her approach before proceeding with this check.*

## **2. APPR gathered from a cooperative**

### Description:

The case of a cooperative is a special case. Firstly, not all cooperative members may be ready to collaborate. Secondly, cooperative members may represent different realities: large versus small producers. Thirdly, the degree of modernization, the layout, crop variety, timing etc. may be very different.

Starting a VC in a collaborative way requires first identifying those members interested, and secondly explore the most compatible methods to gather the biomass. After this exercise, it is possible that a part of the interested members are ideal for a supply scheme (e.g. sharing a machinery bought by the cooperative), whereas other may decide to purchase their own machinery. Then the economic transactions between the cooperative and each member depend on the amount of biomass provided, and on the model under which they provide the biomass.


A good factor of cooperative collection arises when the biomass is consumed in the cooperative. In such way, costs and gains are internalized, and all members understand there is an intangible value for the cooperative image or economic accounting. The economic transactions may be facilitated by reducing the annual fee according to the biomass collected, etc. That means no money transaction but an internal re-arrangement of the usual economic transactions.

### Items to be checked:

- The VC has been presented and discussed with cooperative members?
- Is there already an important fraction aligned with the idea of gathering APPR biomass?
- Is the biomass going to be consumed in the cooperative facilities?
- Is it clear who will buy the machinery? And how the biomass will be transported to the cooperative storage?
- Is it clear how to arrange the economic transactions/compensations?

*If any of the previous items were not considered, the consultant may need to re-think his/her approach before proceeding with this check.*



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### 3. APPR biomass to be sold as woodchips /shredded material

#### Description:

This is the case where the collection of biomass is performed by an actor that is not the farmer or the cooperative. Then the costs of harvesting is on a third company, usually an agricultural services company.

Now the costs are not internalized and an economic transaction may be necessary: either the company pays the landowner, or the owner pays the company for the service. It depends. When the biomass price is high like gold, the company should pay. Otherwise, the most common case, the farmer should pay for the service.

In this case, there is an important non-technical barrier: the farmer sees that he must pay to an external company which gathers his residues and sells them to make a profit. In the eyes of farmers, it is usually “evidently” unfair. And they reject and prefer continuing their usual disposal of APPR biomass instead of paying.

The balance is possible. For example, a farmer paying 20 €/ha to the company, is probably saving 20, 30 €/ha which may be his costs to perform the disposal of pruning biomass. In case of Plantation Removal, they could pay the company 400 €/ha, which is a good price in Spain in comparison with their costs or contracting an external company that performs the works as usual (they may ask for > 600 €/ha). So it is crucial to visualize both actors that both gain, and that the gains are similar.

The PrMov could be the service company or could be a biomass trader that is contracting the service company. In this case, the PrMov is investing in everything except the boiler but cannot control neither the supply (is not the farmer, cooperative or APPR residues producer), nor the utilization of the APPR biomass (he does not operate the boiler). So, the market niches must be clear, the profit margin should be large, and the capacity of consumers to use the biomass must be ensured.

#### Items to be checked:

- The prime mover has sufficient links to farmers who will contract the service
- The model has been discussed: there is no reluctance of farmers, they are not suspicious that somebody is making a profit on their goods (if they consider their APPR biomass is gold).
- The consumers have been identified, and the harvesting system is expected to produce the biomass with sufficient quality for the final consumer.
- A medium to large time contract is regarded with good eyes by the farmers that would contract their services in future.
- A medium to large time contract is regarded with good eyes by the future biomass consumers.
- The profit margin is large, in order to buffer potential deviations.


*If any of the previous items were not considered, the consultant may need to re-think his/her approach before proceeding with this check.*

### 4. APPR biomass to be sold as pellets

#### Description:

This case can be similar to the previous case. So read also and check the items for case 3.



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In case of a cooperative or farmer using pellets for self-consumption, read the considerations below for these specific cases.

Pelleting is thought as one of the solutions for APPR biomass. When pelleting, one of the troubles of APPR is solved: the inhomogeneity of the material (shredded or chipped APPR biomass is not compatible with the majority of the existing woodchip boilers).

However, not always the pruning pelleting initiatives have proceeded. Mostly because of high processing costs, deterioration of pelleting systems (due to the abrasive effect of soil, sand on the extruding matrix), and the lower quality of pellets in respect to EN-PLUS pellets (causes the profitability to be tight, or to fail).

When an entrepreneur goes for pellets of APPR biomass, he ends up with a product to be sold at higher price than, for example, woodchips (which are dry, and in common format are very good fuel). But the APPR pellets have a lower value than EN-Plus, and cannot be burnt in domestic pellets boilers. So they compete with bulk pellets sold to industry applications, which price is lower. In many cases, industrial consumers use woodchips instead of "industrial pellets" since woodchips are cheaper. Thus the niche of the market may be quite limited if not sufficient consumers of industrial pellets are at the reach of the initiative. Note also that these consumers may have their supply satisfied already with usual providers.

#### Items to be checked:

- The PrMov has chosen the production of pellets because he/she knows a niche market ready to consume them (usually consumers of industrial pellets).
- Feasibility depends on the price of the biomass to be replaced. This has been explored, and apparently there is a good profit margin.
- The APPR wood required usually cleaning before being pelletised: screening, washing, etc. These costs have been taken into account. Also, the losses of fractions separated.
- Since the APPR biomass will be extruded in a pelleting matrix. Stones are not allowed. Soil particles cause an abrasive effect in the milling and in the pelleting matrix. The extra costs of operation and deterioration of mills, pelleting matrix etc. have been included.
- All providers are aware of your initiative and have expressed their equipment can cope with the APPR biomass transformation.

*If any of the previous items were not considered, the consultant may need to re-think his/her approach before proceeding with this check.*


## **5. ESCO selling heat produced from APPR biomass**

### Description:

In this case, the facility owner does not take care of the fuel supply. The ESCO operates and maintains the facility, and the consumer pays for the service of a constant and quality heat. In this case, the ESCO can choose the most appropriate fuel. As well, they can choose the best boiler and facility systems to ensure that the facility is compatible with the range of biomass they will base on (probably not only APPR biomass but other biomass types).

In this case, the problem is that ESCO has to take care of all activities. But as well, ESCOs are not well connected to the agricultural sector.



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Depending on the reach of activities managed by the ESCO, some items from case 3 and 4 may be relevant to be checked.

Items to be checked:

- The ESCO has a good connection with local farms.
- The ESCO accounts with the key stakeholders that will perform the harvesting / chipping operations.
- The harvesting of biomass is now in hands of a third company, not internalised by the farmer. Unless the market price of biomass is too high, usually the farmer will have to compensate or participate in the costs and operations of harvesting. If all costs are allocated to the agricultural service company, farmers probably will save much money, but the external company will bankrupt.
- The ESCO has experience in biomass and/or have a good technology partner.
- The ESCO has a clear idea of the niche market in the area.

*If any of the previous items were not considered, the consultant may need to re-think his/her approach before proceeding with this check.*

## 6. Public authority and waste management schemes

Description:

Several initiatives in Europe started from the awareness and concerns of public authorities and other public bodies in respect to the management of organic residues (either APPR or also gardening, or other residues).

The public entity decides to promote an action. In some cases internalised as part of the public services executed by their brigades, and in some others externalised (managed by the council, but contracted to an external company). In this case, the costs may be above the market price of biomass since it is a work performed because of a public interest. However, there are cases of councils that have achieved reductions in their monthly energy bill.


The problems sometimes are that some public bodies may not be allowed acquiring machinery, or to perform services inside private lands (gathering biomass along the rows of a private orchard). Also, their reach can be not further than the council municipality borders.

Items to be checked:

- Has the council decided if the work will be carried out by public brigades or buy an external company?
- Do they have any idea of a potential number of owners demanding the service? The potential? And the volume of calls it may be necessary to coordinate the collection?
- In case the solution is the public brigade:
  - Do they have competent persons and means? Will they be able to incorporate them?
  - Is it compatible to perform a service into a private land?
  - If orchard owners push the residues outside, could it be subject of concerns raised by the neighbourhood?
- In case the solution is an externalisation:





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- Is their activity in the municipality compatible with other services of APPR collection in other areas?
- Is it clear the transfer of the APPR? Who is the owner? Who has the right to exploit it?
- Are there companies reliable in the area to perform this new and innovative service?

If any of the previous items were not considered, the consultant may need to re-think his/her approach before proceeding with this check.










## APPR biomass value

This section aims to reflect if the PrMov has considered the consumer/market needs.

If there is no market, or if the consumers' profile and specific interests have not been detected, the next step is to carry out such market research. No consumer means no value, and so no sense to try to launch a new APPR VC.


### a) Consumers profile

The final consumers, not a generic market, fix the value of APPR biomass. Note that where APPR biomass is not being exploited there is no APPR market. There might be some "woodchip" market. But APPR biomass is something else.








To be checked	Mark:   
The biomass consumed/desired/compatible with the final consumer is known. <i>Starting selling biomass requires the PrMov to know what is the product demanded by their final consumers. Has it been identified? This is a basic and crucial issue, and that is why we start with this as first checkpoint.</i>	If you have marked  , then include a corrective action below E.g.: specifications of biomass should be obtained, e.g. by talking to other providers of biomass.
The consumers have been contacted directly by the PrMov <i>Putting into operation a new VC needs that there exist somebody willing to purchase the APPR biomass. If not, the PrMov may have just got some info from a web, or from another stakeholder. If there has been no direct contact, it should be performed (by the PrMov).</i>	If you have marked  , then include a corrective action below E.g.: a further approach to the consumer may be needed.
The amount of biomass to be collected/handled by the PrMov is known. The capacity of consumption by consumers is known as well. <i>You should know the tons you are able to collect per year. And also you should know the volumes that diverse consumers (or intermediaries) would be ready to purchase to you.</i>	If you have marked  , then include a corrective action below E.g.: review the potential biomass available in the area from engaged providers.
You have a clear idea of how the consumer receives biomass (just in time; batches every several weeks; etc.). <i>This affects quite the organization of the activities upstream the final consumer. It should be clear.</i>	If you have marked  , then include a corrective action below E.g.: Further research or contact with Consumer may be needed.











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## b) Consumers value and interest

To be checked	Mark:   
<p>The PrMov knows the “expectations” of the future APPR consumer.</p> <p><i>For example, some consumers may be enthusiastic to try a batch of the APPR biomass because they see as an opportunity for saving much money. Or they are just "fine" with this opportunity of widening their supply. Note it is crucial to understand how so keen is the consumer to actually perform future purchases. If not so much, you need to add some extra value to your value proposition (your biomass/your service)</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: a further approach to the consumer may be needed</p>
<p>The PrMov knows the needs of the future APPR consumers</p> <p><i>Beyond of the questions above, here it is asked to which extent the PrMov knows the needs of the consumer. We mean, not just to know the biomass and specifications, but what they really like, what they really detest, and their usual "pains". The success of a business is based on covering the needs of a consumer. PrMov should be sure that the APPR biomass covers their needs. In general, it has to do with biomass quality preferred, delivery format, availability for prompt requests, etc.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: a further approach to the consumer may be needed.</p>
<p>The nontangible values have been identified</p> <p><i>Is APPR biomass bringing them a nice image? Is it going to be announced? Can you offer a service that cover part of their "pains" and that is not just an issue of price? (e.g.: if a power plant nearby a population is the object of criticism (truck traffic, dust during downloads) maybe you can offer something: use of clean and low-noise trucks, low-dust discharging systems, etc.)</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: a further approach to the consumer may be needed.</p>
<p>The price the consumer will pay is lower/higher than the usually consumed biomass because the APPR biomass has worse/better quality.</p> <p><i>APPR biomass is similar or better in energy, shape, or composition than certain types of biomass (straw, garden residues, forestry residues, dehydrated sludges, corn stover, etc.). However is in general more complicated for handling and burning than forestry woodchips, wood pellets, olive pit, almond shells or gasoil. You should be aware of this issue.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: a further approach to the consumer may be needed to understand the price to be paid by ton of APPR biomass.</p>

## c) Conformity / compatibility of APPR biomass

To be checked	Mark:   
<p>The PrMov has obtained and touched a batch of the APPR biomass.</p> <p><i>Note that APPR biomass is usually very heterogeneous. If you do not have a batch as a sample, we recommend you contact an actor able to explain, give a sample or pictures of the material</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: approach some machinery provider or other VC to get a batch.</p>
<p>The PrMov has stated the systems needed in the final consumers' facility to feed the APPR biomass.</p> <p><i>Burning APPR inhomogeneous material is not easy in conventional boilers designed for clean and regular woodchips or for pellets. In case of the existing facility: make sure the boiler is compatible. In case of a new facility for APPR: make sure the facility provider sees a batch of material before designing it.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: approach some of the potential facility providers to consult.</p>








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<p>The storage, handling and feeding system to the final consumer facility are compatible with the APPR biomass</p> <p><i>Not only the boiler. But also the feeding systems should be ready to use APPR biomass. E.g. regular screw feeders may fail in conveying biomass APPR. E.g. regular hoppers may cause biomass clogging.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: approach some of the potential facility providers to consult.</p>
<p>The PrMov has obtained the fuel data analysis of the APPR biomass.</p> <p><i>No sale if your biomass does not comply with consumer expectations. Avoid copying from literature. And note that pruning from tree is much moist than biomass at consumer gate.</i></p>	<p>If you have marked , then include a corrective action below</p>
<p>In case of APPR pellets, if they are intended to replace EN-PLUS (&lt;1%ash), you have stated that boiler is able to use such pellets (usually above 3% ash).</p> <p><i>Pellets are sometimes appreciated as they solve the APPR inhomogeneity. However, EN-PLUS pellets are consumed in facilities usually incompatible with ash-rich pellets.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: check with boiler manufacturer or facility provider the compatibility, and that the boiler guarantee will be preserved when switching to APPR pellets.</p>





### 3 Bringing value to consumers

This section aims to Review the organisation of the logistics chain, and if the operations carried out are logical, or if any potential step in the VC has been disregarded







#### a) Logistic organization


To be checked	Mark:   
<p>You have seen the harvesting machinery to be utilized in operation.</p> <p><i>The collection of APPR biomass is not a usual practice. When going to reality, inexperienced stakeholders/entrepreneurs realise the operations are slower than expected, troublesome, or simply inadequate.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: visit a site where the machinery is being utilized.</p>
<p>You have seen how the handling of biomass is performed.</p> <p><i>Observing loading/unloading, haulage, discharge of trucks/hoppers may reveal unexpected troubles.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: visit a site where the machinery is being utilized.</p>
<p>The harvesting method has been discussed with several stakeholders.</p> <p><i>Harvesting is usually an operation with impact in about 40% or more of the final APPR cost. If there has been no discussion, probably the idea in the head of the PrMov is simply immature.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: establish a dialogue between PrMov, VC actors, or even with some company in charge of doing it.</p>
<p>The organization of the wood transfer from field to truck or storage has been object of a deep thought, and several alternatives have been discarded.</p> <p><i>The biomass transfer is not the largest cost if a good and simple system is chosen. But wrong decisions rise much the costs. Some examples: Leaving bales along crop rows requires spending hours later on to gather bales (1 bale = 200 kg). Making multiple biomass heaps at the field side; driving a pruning harvester several hundred meters to make a discharge of 1 m<sup>3</sup> is senseless.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: review the methods of discharge at field side, load to a truck, etc. between PrMov and VC actors.</p>




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<p>It is clear the ownership of the means utilized during the transfer of biomass from stakeholder to stakeholder.</p> <p><i>Loading with a tractor shovel can be a possible practice. But if you have to drive several kms to load a 4 t truck, does not make sense. In such case, a farmer could participate by performing the loading with his tractor.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: like the case above.</p>
<p>The need of screening the biomass to separate stones, large fractions, fines or other inorganics has been object of consideration.</p> <p><i>Not every consumer can use APPR biomass. If you have discussed and have made a decision, probably you did not overlook this necessary reflection. If you didn't, you risk that you are not being sufficiently realistic in your scope of VC.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: like the case above.</p>
<p>The different alternatives for storage have been discussed.</p> <p><i>Storage is at all evident. As in previous items, check if you did think on the activity, or if you did just not get into details. Covered? Uncovered? In large piles? Subject of previous screening?</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: like the case above.</p>
<p>The information flow is clear and reachable by all the VC actors.</p> <p><i>How can the consumer demand more biomass? How does the intermediary seek for a compatible batch? How does he contact the provider? Not an issue in small and self-consumption schemes. But it can be a nightmare in large VCs.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: the main actors in the VC to be contacted, gather their ideas, and put together to see if the information flow looks coherent.</p>

## b) Review of some critical items on quality

To be checked	Mark:   
<p>Pruning biomass: Some practices must be avoided, unless the final consumer is ready to use biomass with stones, inorganics, soil, etc. Check the list below.</p> <p><i>If any of them occur, probably you should re-arrange the VC.</i></p> <ul style="list-style-type: none"> <li>• pushing out the branches with forwarder</li> <li>• downloading wood pieces on unpaved soil</li> <li>• harvesting moist &gt;30% and direct storage</li> <li>• storage long time uncovered</li> </ul>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: discuss with the stakeholder involved about alternatives</p>
<p>Plantation removal: Some practices must be avoided, unless the final consumer is ready to use biomass with stones, inorganics, soil, etc.</p> <p><i>If any of them occur, probably you should re-arrange the VC.</i></p> <ul style="list-style-type: none"> <li>• mixing tree wood and root wood</li> <li>• downloading wood pieces on unpaved soil</li> <li>• harvesting moist &gt;30% and direct storage</li> <li>• storage long time uncovered</li> </ul>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: discuss with the stakeholder involved about alternatives</p>
<p>You should not expect pruning biomass with less than 3% ash content, or plantation removal tree wood with less than 2% ash.</p> <p><i>APPR residues are not like forestry debarked stemwood, which ash content can be lower than 1%. Here the APPR contains bark, leaves, and dust. Further, the logistic operations can add much soil and stones. In case they were considered, the process of screening, and even washing the APPR biomass may be necessary.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: review who / from where was it induced that APPR biomass would be so clean. Contact the stakeholders involved to ask about.</p>








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<p>Moisture has been taken into account when designing the chain and when discussing with stakeholders.</p> <p><i>Moist woodchips and shredded material tend to decompose rapidly. Check if your chain is subject of this problem (you can avoid by leaving branches/trees for several weeks before collecting, or by performing a drying before storage).</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: discuss with an expert about the best option for storage for the APPR biomass to be produced.</p>
<p>The points where biomass can be impoverished along the VC have been identified.</p> <p><i>Quality can be preserved only when the actors perform their operations properly, and there are some critical points. Check next.</i></p> <ul style="list-style-type: none"> <li>• Loads and unloads: are you sure the VC actors will perform on paved soil?</li> <li>• Transport: are you sure the transport will be done in clean paces? (without plastics, metals, etc.)</li> <li>• Intermediary: take care, they may be tempted to mix APPR biomass with waste-wood or other low-quality wood</li> </ul>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: depict the VC, and VC actors. Elucidate where such cases could take place.</p>
<p>The points of quality control are clear.</p> <p><i>Especially in chains where the biomass is transferred between several actors, quality control is essential. This is a measure preventing VC actors to perform bad practices, and useful to detect low-quality batches. It also allow to reinforce the confidence among actors participating in long VCs.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: similar to above.</p>

#### **Added value to all stakeholders**

This section aims to check the matureness of the data for the added value of the proposed VC. As well, special focus is placed on VC Actors: their readiness, their gains, their costs.

##### **a) VC actor gains and roles**

To be checked	Mark:   
<p>Are all actors to be involved in the VC ready to start?</p> <p><i>Starting new activity is "easier said than done". Some actors will regret when being asked to invest, or to provide a service, or to consume biomass. An engagement is necessary: convincing and creating confidence.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: discuss PrMov with other stakeholders.</p>
<p>All operations in the VC are assigned to a specific VC actor.</p> <p><i>Depicting the VC, quoting all activities and assigning a response is necessary.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: review the VC between PrMov and other VC actors.</p>
<p>All VC actors have a gain, a saving, a profit or a reason why they want to participate in the VC.</p> <p><i>All VC actors must have a gain. If not, the VC I simply unfeasible. It should help to tune the costs, profit margins, or to ask for example farmers to add value or execute some operations "for free". The template on feasibility is helpful for this purpose.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: review the VC between PrMov and other VC actors.</p>
<p>Profit margin along the VC is larger than 10€/t.</p> <p><i>Otherwise, there may be not sufficient driving force to start the VC. For those actors making a profit at least 5 €/t is recommended.</i></p>	<p>If you have marked , then include a corrective action below</p> <p>E.g.: identify</p>

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## 5 Final consideration


The consistency check serves to revise many issues of the VCs. Initially was thought as a way to select the best organisation of the different operations (harvesting, loading, storage, etc.).

After performing the analysis, it is good to write down the most worrying issues. The corrective actions can be part of the consultancy services.

Notwithstanding, some of them may be out of the accompaniment, or too early for some entrepreneurs, and they may be considered as key activities to be included in their business model.

As well, this exercise is connected with the risk assessment of the APPR biomass project. Thus, after performing a checklist, the consultant can be aware of some threats and some weakness of the initiative of the entrepreneur. So, it is also good to put these early "findings" in the template for risk assessment.

The consistency check will be helpful for the consultant to make diagnosis how feasible is the proposed APPR biomass value chain.

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## Annex VI Template for the final report

### I. Introduction

Describe the idea of APPR biomass value chain, “prime mover”, key actors, and place.

### II. APPR biomass potential

Give data about APPR biomass potential: type of APPR biomass, months when it is available, volume in tons, moisture content.

### III. Local biomass market

Summarize the main results gathered and answer the following questions:

Is the APPR biomass produced “appealing” for end-users?

Is it necessary to improve some of its quality characteristics (size distribution, ash content, etc.)?

Is the economic value expected by end-users aligned with the objectives of the APPR supplier?

### IV. APPR value chain actors

Give information about actors of APPR biomass value chain and their roles.

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								
	Harvesting & conditioning								
	Biomass 1 <sup>st</sup> Haulage / Transport								
	Pre-treatment & storage								
	Biomass further processing								
	Biomass transport								
	Energy conversion								

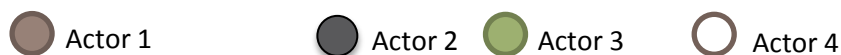



Figure VI.1. Diagram of the Value Chain model.

### V. APPR value chain operations

Specify the APPR value chain operations with machinery and actors.



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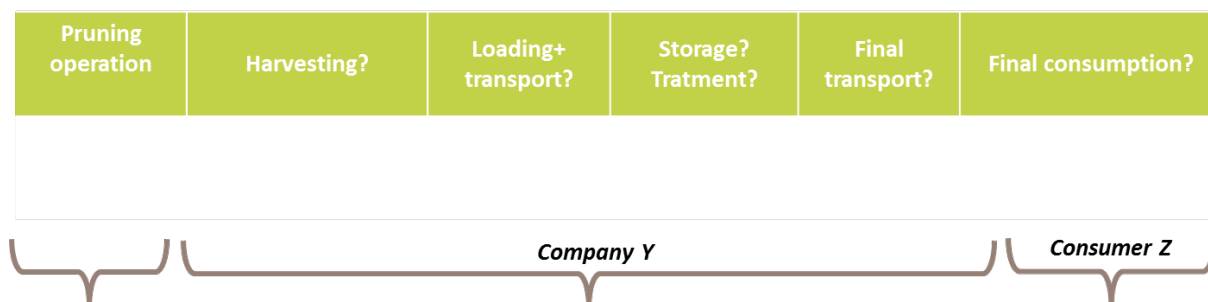


Figure VI.2. Diagram of the Value Chain operations.

#### **VI. Risk and sustainability assessment**

Give SWOT analysis, results of sustainability assessment.

#### **VII. Feasibility study (if it was done)**


Summarize the main results (NPV, IRR, PP, distribution of costs among value chain actors) for the scenarios that have been studied. Underline the factors that can be of major interest for the entrepreneur point of view.

#### **VIII. Conclusions and Recommendations**

Summarize within a paragraph the main conclusions of the APPR biomass value chain.

Describe briefly or enumerate the potential improvements.

Results of diagnosis for APPR biomass value chain and recommendation for the next steps

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## Annex VII Declaration of Commitment



### DECLARATION OF COMMITMENT

With this letter of commitment **name of a person**, from **name of a company**, located in **country**, address: **address**, hereby declares that:

- Has received consultancy services from uP\_running project's consultant on **consultancy subject**.
  - Gives his authorization to use the main results of the work performed within T4.1 and 4.2.
- Visit participant list is attached.

**Place, date**

**Company's representative** \_\_\_\_\_ (sign)


**Consultant** \_\_\_\_\_ (sign)



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## Annex VIII Attendance sheet



### VISIT (MEETING) PARTICIPANT LIST

**Place, date**

No	Name	Company, Position	Contact data	Sign
1				
2				
3				
...				
N				



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