# SETTING UP AND RUNNING SUSTAINABLE SUPPLY OF WOODY BIOMASS FROM AGRARIAN PRUNING AND PLANTATION REMOVAL. SCOPE AND EUROPEAN INITIATIVE

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ABSTRACT: This paper presents a new European initiative, the uP_running project, which aims to set the path for the development of the bioenergy utilisation of agrarian pruning and plantation removal (APPR). These woody residues are not being used currently, although they present a high potential in the European Union due to a large cultivated area of vineyards, olive groves and fruit tree plantations. uP_running vocation is the abatement of the current immobility of the value chain actors for the utilization of APPR woody biomass. For that purpose, this project incorporates a set of straight actions aimed to reshape the sectors perception, to provide evidences of real success and replicable models to follow, as well as create a permanent capacity in Europe to give support for decision making to farmers, cooperatives and agro-industries. Moreover, an impact on policy barriers and on the legal framework currently setting limits for the utilisation of APPR wood will be carried out through direct advocacy and lobbying work at national and EU level. Setting up and running new APPR biomass value chains is the key for a self-replication and to further contribute to the development of the bio-economy in Europe. The actions will be initiated in a set of 4 “demo” countries (that together account for 50% of EU potential), replicated in 3 relevant EU countries, and extended through precursor actions to 7 additional EU countries.
Keywords: agricultural residues, logistics, feasibility studies, guidelines, training, rural development

## 1 INTRODUCTION

European countries add in total a large area cultivated with vineyards, olive and fruit plantations (usually referred as “permanent crops” in statistical yearbooks and EUROSTAT). From the different pruning activities that are carried out to maintain the health of the tree and to increase the fruit production, among others, high amounts of residues are being produced and disposed year after year in Europe. Unfortunately, the general status in Europe it that wood from agrarian pruning and plantation removal (APPR) is mainly burn in open-air fires, shred on top-soil just as the simplest method to dispose the residue, or only in some cases, utilised as firewood.

From the analysis of the current situation, partially performed through EuroPruning project [1], a certain number of technical barriers have been detected but it seems that the non-technical barriers are the ones that mostly explain the current immobility of the sector. Also, the detection of several successful pruning value chains along the UE have demonstrated that these initiatives are both technically- and economically- feasible. In particular, EuroPruning project has identified and documented a total of 18 existing pruning value chains: 8 in Spain, 2 in France, 2 in Italy, 2 in Germany, 3 in Poland and 1 in Denmark. It has been stated that pruning biomass value chains are usually developed at local scale, but they used to remain unknown by the society. Furthermore, it seems that in agrarian areas where vineyards, fruit or olive are being cultivated, multiple local initiatives may be going on. In the case of Spain, CIRCE has explored the APPR reality. The first evidences are the large plants built in Andalusia for the energy valorisation of olive mill waste (called "*orujo*" or "*alperujo*"). There several plants of 10 to 15 MW of electrical power were built for this purpose and are now co-feeding pruning wood. Some other initiatives at large scale are the “Pellets de la Mancha” pelleting plant, a unique case in the world of a centralised facility built for the unique purpose of adding value to agrarian pruning residues. In addition, and beyond these large-scale initiatives, several local success cases are slowly being disseminated, like pruning consumption in short local value chains, including caves, fruit companies or farmers. Moreover, utilisation of biomass from removal plantation is already a reality, as shown in fruit production companies that use their own residues, as for example NUFRI, in Mollerusa.

This paper describes a new EU H2020 initiative, the uP_running project, which has been constructed in order to drive a change and to unlock the current situation of immobility in the APPR sector. More specifically, main goal of uP_running project is to release the European strong potential of woody biomass residues produced by APPR and to promote its sustainable use as energy feedstock. This project is based on the conviction that APPR use for energy is possible, which is supported by the different success cases identified up to now through Europe. In the present paper, details about the current situation of APPR residues is discussed and the principal actions that will be performed by uP_running project are presented, underlying how they have been planned to convince the different value chain actors and to unlock the existing immobility.

## 2 FRAMEWORK

The EU policy of the European Commission is built upon having secure, sustainable and affordable energy. As part of this policy, the European Commission has committed to make of the European Union the Nr1 in renewable energies [2].

In October 2015 the Commission reviewed the Research and Innovation strategy to adapt it to the Energy Union principles, in the Integrated Strategic Energy Technology Plan [3]. The SET-plan aims at developing and accelerating the time to market of affordable, cost-effective and resource-efficient low carbon energy technologies to decarbonise the energy system sustainably and to increase the role of domestic resources. It sets a list of 10 actions to reach its objective. Among other actions, it should sustain the EU technological leadership and reduce the cost of key energy technologies, and to reinforce the heating & cooling and building policies to cope with more energy efficiency and renewables.

In this context, the Horizon 2020 project uP_running has an important role to play. uP_running promotes the sustainable supply of woody biomass for energy production focusing on indigenous pruning and removals. This type of bioenergy is sustainable as it emits less life cycle $CO_2$-eq than the fossil fuel it substitutes, decarbonising of the energy system; it increases security of supply as it is obtained from European lands, at an affordable cost as it makes use of a residue that is normally burned in the field or disposed. uP_running contributes to the reinforcement of the technological leadership of the EU in the field of bioenergy and to increase the use of renewables in buildings and for heating and cooling production.

## 3 STATUS

### 3.1 Current situation

Europe accounts with a total area of 10.6 Mha of vineyards, olive and fruit plantations. This area represents a share in the cultivated area of 6% and several sources point out potential of pruning wood represent from 20 to 25 Mt (fresh biomass) per year [1, 4]. Wood from tree removal at the end of a plantation may add further 15 Mt of resource. All together the potential as dry matter can reach 20 Mt/yr. The estimated potentials of these APPR residues are depicted in Fig. 1, for the EU28 and other European countries.

The current management of APPR biomass residues has been analysed by EuroPruning [1] in ten European countries during 2014. The analysis reveals that most of the pruning wood is not being utilised currently, except thick branches for firewood in rural areas. It also reveals that some “modern” chains are already set, but under closed-loops or based on bilateral relations between a producer and a consumer. This fact has also been stated by the regional analysis of SUCELLOG project in twenty regions of four EU countries [5].

The preferred alternatives for the management of agrarian pruning wood are the burning in open-air fires (either under regulated, or under un-controlled conditions), or shredding to leave the pruning in pieces as green cover for the top-soil. The utilisation of pruning wood as organic amendment is a generalised practice in some areas, but not always being a competitive use. There is a general belief that the best use of pruning is as input for soils, though this believe also remains in the mind of farmers and companies with soils already rich in organic matter.

Wood from up-rooted plantations is more commonly utilised as source for producing wood chips or firewood. Most of the facts described for pruning wood apply to wood from trees removed after the end of the plantation cycle. The difference strives in the large accumulation of wood during the lifetime of the plantation, which allows the production of high volumes of wood at once.

Finally, it should be underlined that the review of the National Renewable Energy Action Plans (NREAP) of the 28 EU member states has shown that only one of them, for Spain, accounts with a specific mention to APPR potential and strategic guidelines. Concerning the other countries, just few of them include a standard table where wine and fruit clippings (referring to pruning) are mentioned, but without any value or references in text.

### 3.2 Main barriers to overcome

The current immobility affecting APPR sector may be explained by several barriers, including technical and non-technical.

Among the technical barriers and as compared to herbaceous crop and agro-industry residues (the main agricultural residues used for energy purposes), harvesting and mobilisation of APPR wood is complex, especially for a large-scale logistics.

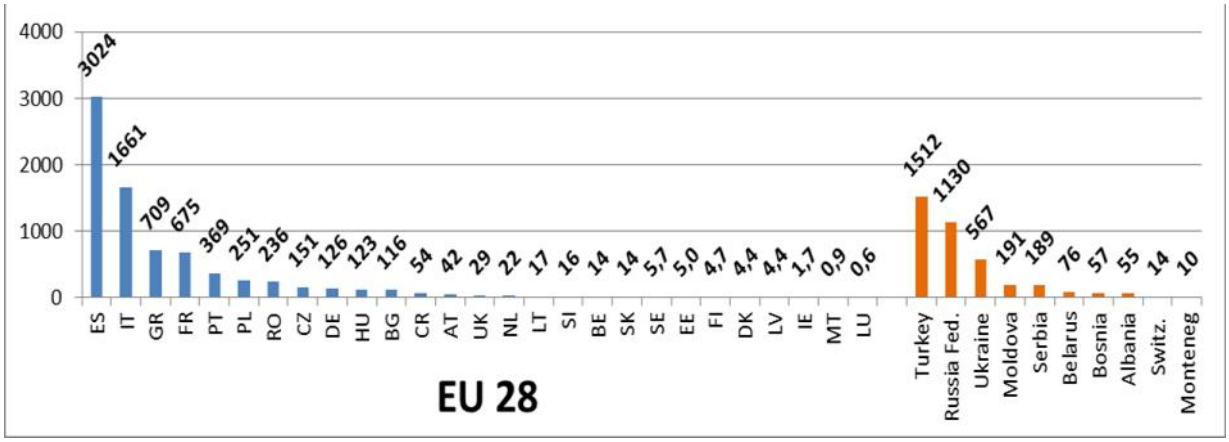


**Figure 1:** Estimated APPR potentials (kt/year dry matter) in EU28 and other European countries.

Although there is an important amount of harvesting technologies, with different technological approaches (adapted mulchers, chippers, balers), the model used to be adapted for specific crop layouts (width of rows, maximum height allowed for the machine, etc.). Accordingly, when facing a large-scale production, the problem is the versatility of the machinery (to harvest branches of very different size, length, shape and amount per hectare). In addition, product quality is a very important issue, especially regarding ash content, size distribution and heating values.

As regards the non-technical barriers, which are the main focus of uP_running project, they are in most cases the reason for a scarce utilisation of wood from APPRs in Europe. Among them to be quoted: scarce awareness of agrarian sector and energy sector, that this biomass can be an alternative source for energy, and a general scepticism, as regard to the technical difficulties and the occurrence of non-successful experiences. The following "problem" tree (see **Figure 2**) summarises the analysis, which is the base to orientate the uP_running project, aiming to overcome and eliminate, at least partially, some of the non-technical barriers.

As observed in the problem tree diagram, there is a circular problem, i.e., a vicious cycle presented by the red arrows in **Figure 2**. This vicious cycle ends-up in the fact that, neither the producers, nor the consumers in general have a solid interest in giving a value as energy feedstock to most of the woody APPR.

The current underlying situation is that there is an absence of sufficient APPR biomass in the market as a consequence of the difficulties to obtain the biomass (with respect to other feedstock like straw) and the distance between the agrarian and other multiple key actors, leading to few initiatives and to unsuccessful experiences. Even though some modern uses of APPR already exist, they remain unknown.

The situation also leads to a lack of interest of most of actors, causing a limited propagation of new successful experiences. It is quite symptomatic that in the current moment, where energy efficiency in the agrarian sector has already raised awareness, APPR still do not find the path for being exploited. The absence of information on relying and replicable experiences and models to follow, makes the agrarian sector to remain immobile and does not promote an increase of the demand. This is furthermore aggravated by the fact that bioenergy key actors and knowledge is far from the agrarian sector in many cases, and so, logistic and biomass suppliers are unwise on the needs of the agrarian sector. These key actors are more used to feedstock with exiting solutions like agro-industry residues or straw, which already have large uses and its handling and logistic is better known. Actually, they find the field of woody residues form agrarian plantations difficult. Applying similar schemes than for straw or forestry biomass lead to unsuccessful chains in terms of any or various of next issues: technical feasibility, biomass quality (as regard of end user demand), and so, in general to non-profitable experiences.

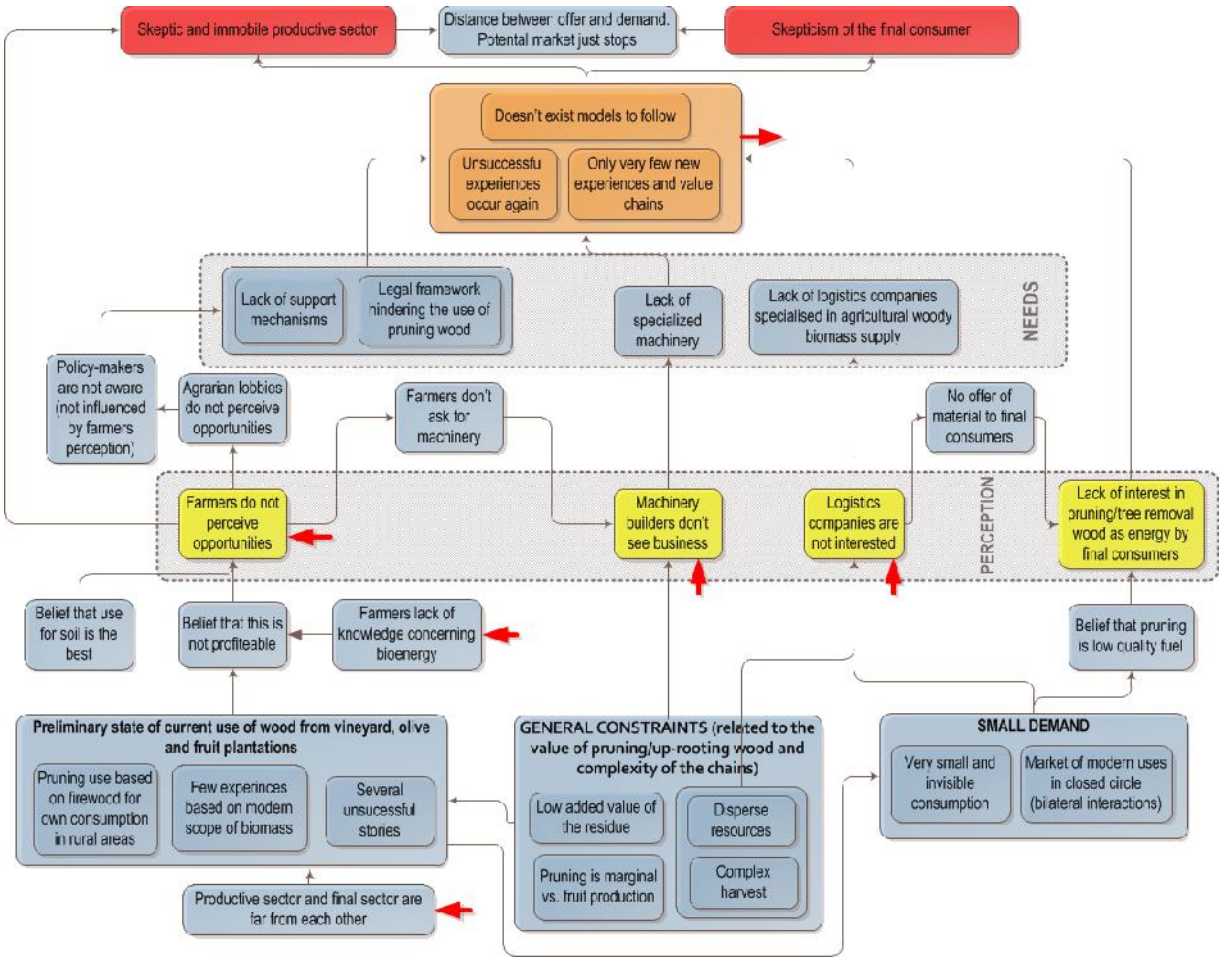


**Figure 2:** Tree problem for the utilisation of wood from APPR.

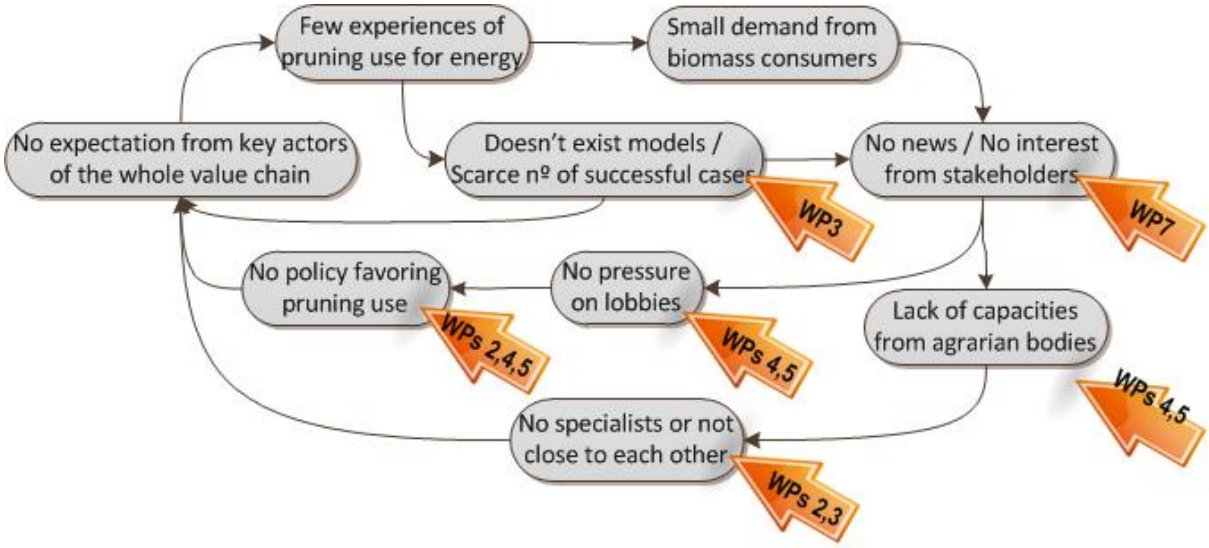


**Figure 3:** uP_running simplified vicious cycle and strategy of uP_running WPs.

## 4 UP_RUNNING PROJECT

### 4.1 Breaking the vicious cycle

The problems diagram presented in **Figure 2** can be summarised in a very simplified vicious cycle as presented in **Figure 3**. There it has been depicted the current situation leading to immobility, and where the uP_running activities (WPs) will act to drive a change and convert the vicious cycle into a virtuous cycle.

To resolve the vicious cycle it is necessary to increase the expectations and interest of the agrarian sector, final consumers and intermediary sectors (biomass suppliers and logistics companies). Actions as proposed in the concept (**Table I**) have been planned to unlock the current situation, and so, to cause more producers to make a decision to mobilise their biomass, accompanied by other key stakeholders for the value chain.

### 4.2 Main activities

In order to cause an effect in the utilisation of APPR wood, uP_running proposes to establish actions orientated to three main targets, as can be seen in **Table I**. The objective is to firstly demonstrate and produce key tools, then to convince thanks to a strong communication campaign and finally to expand this feedstock utilization through the involvement of multiple pan-European targets and key actors.

In the first set of actions (aimed at producing key items), the identification and documentation of existing success cases as well as the implementation of new value chains will be a fundamental activity. Particularly, uP_running will carry out 20 demonstrations in 4 key European countries and will monitor 4 new value chains. In addition, uP_running will produce tailored strategic plans and policy guidelines for seven EU countries, as well as a roadmap for Europe that outlines recommendations for implementing the policy measures, entrepreneurship programs, financial instruments and R&D programs needed to support the development of this bioenergy sector.

Within the second group of activities, an important communication campaign will be carried out in order to place the project key materials and results at the disposal of a large audience (both target and key actors) for their utilisation during and beyond of project life-span. Direct involvement of relevant actors will further support this campaign through 16 regional workshops, 7 national lobbying workshops with key clusters, 14 national dissemination events, and 3 EU workshops networking events. Besides, an Observatory of APPR potential and utilisation will be created, in order to register and share all experiences and success cases identified by uP_running and to promote an active observation and reporting of APPR potentials from the agrarian sector

Finally, and as regards the last group of actions, new and permanent capacities of consultancy will be created to support decision making of farmers, cooperatives and agro-industries in Europe. More than 100 national and regional agrarian associations, public extension services and private consultants in 14 demo countries will be provided with materials and capacities to perform consultancy on the best decisions for the energy utilisation of the APPR wood.

**Table I:** The three main types of activities promoted by uP_running project.

| | |
|---|---|
|  | **Production of key items to overcome existing barriers**<br>Actions aimed to produce the information and materials needed by the sector (to be utilised in communication campaign and multiplication activities) |
|  | **Communication and dissemination**<br>Aimed to make a change in mind. Also as a tool for involvement of stakeholders and bring attraction of sectors in the project |
|  | **Project impacts multiplication**<br>Aimed to cause a replication of external agencies of uP_running approach, so that it increases the chances of new farmers, cooperatives and agro-industries willing to start new chains |

### 4.3 Impact

As it has been seen previously, uP_running activities are designed to boost the sustainable use of currently infra-utilised agricultural residues like APPR wood, by

several means during and beyond the project duration (2016-2019). In this section, the main expected impacts of the project are summarised.

Firstly, uP_running aims to support the take-off of the sustainable utilisation of APPR biomass for energy, contributing to release multiple existing non-technical barriers necessary to cause an impact on the energy sector by making available on the market up to 50% of the potential by 2030. Considering a low heating value of 3500 kcal/kg, this impact is equivalent to 7 Mtoe/year of new feedstock placed in the bioenergy market. Besides, biomass from APPR will contribute to the EU energy security, since the energy demand will be met through locally produced raw material. Thanks to the utilisation of biomass from APPR, the net energy import of EU28 is expected to decrease by 0.76%.

Concerning environmental impacts, utilisation of APPR would stop the un-controlled burning of these residues, then avoiding fire risks and the emission of GHG and other pollutants, especially in Mediterranean countries. Under the assumption that by 2030 the 50% of APPR utilisation will principally come from the valorisation of residues usually burnt in open fields, a total of un-necessary 20 Mt of $CO_2$ per year could be avoided. About fire risks, it is estimated more than 68% of fires are caused in rural areas in Europe, being the burning of agrarian residues one of the principal factors. Avoidance of un-controlled burning could drastically reduce forest fires. Moreover, GHG emissions will also be reduced by the utilisation of APPR, since the replacement of fossil fuels replaced by biomass imply a reduction in $CO_2$.

Finally, important impacts will be caused on the economic growth of the European Union, the increase of competitiveness of agrarian exploitations and the job creation in rural areas. In particular, the development of a APPR market will contribute not only to the creation of new jobs but also to the fixation of the rural population which are especially sensitive to new economic trends, providing a solution to avoid rural migration in European countries.

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## 7 PROJECT AND PARTNERS LOGOS


CONFAGRI
Confederação Nacional das Cooperativas Agrícolas
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ServicesCOOP
DE FRANCE
Union de Coopératives Agricoles


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