Deliverable Nº 3

DOCUMENT WITH THE IMPROVEMENT POSSIBILITIES

UPV

12/31/2018

This deliverable proposes the potential improvements to the current biomass management strategy of Serra.

CURRENT BIOMASS MANAGEMENT PLAN OF SERRA

ACTION A.1: Updating and modelling of Serra's forest and biomass management approach

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Deliverable 3; name: *Updating and modelling of Serra's forest and biomass management approach*

Beneficiary responsible: UPV

Action A1: *Updating and modelling of Serra's forest and biomass management approach*

From month 1 – month 3

Name of the Deliverable	Number of associated action	Deadline
Updating and modelling of Serra's forest and biomass management approach	Updating and modelling of Serra's forest and biomass management approach	12/2018

1. Introduction

Forest biomass is a renewable source of feedstock for energy production. Its use as a renewable energy source has received much attention as a response to climate change and the increasing global demands for energy. Policies in the European Union, the United States, and Canada support the use of forest biomass in heating, power generation, and transportation as a climate mitigation strategy. The EU Renewable Energy Directive sets a target of 20% renewable energy use in 2020 as well as a 10% renewable energy target in transport (European Parliament & Council of the European Union, 2009).

However, in spite of the administrative support, the beneficial effect on climate change remains still unclear. There are studies that affirm that as long as the forest biomass comes from a sustainably managed forest and is replaced (that is, renewed) over time through regrowth, the greenhouse emissions (GHGs) from the production of bioenergy can be considered to offset—at least to a large extent—fossil fuel emissions (European Parliament & Council of the European Union, 2009; U.S. Environmental Protection Agency [U.S. EPA], 2010; Matthews *et al.* 2018). On the contrary, other authors do not see the advantage on using forest biomass instead of fossil fuel in GHGs reduction (Agostini, *et al.* 2014; Giuntoli and Marelli, 2018).

All these studies, whether confirming or not the GHGs decreasing, considered just highly productive zones with a strong forest culture, leaving aside zones such as semi-arid areas where forest management is basically restricted to fire risk. In these areas, the forest biomass production is not conceived just as an alternative energy source or a business opportunity, but it combines circular economy, water production, fire risk reduction and forest climatic resilience. Semi-arid forest productivity is not enough to provide a village a profitable business opportunity, but combing it with other goods and services derived from forest management will give an opportunity to a remote area, create a few jobs, reduce the fire risk, increase water production and the ecosystem resilience against climate change, which in the case of semi-arid regions is closer than ever. Thus, combining all these benefits, even if GHGs advantage is not that clear, there are other benefits that directly affect climate change (water production, fire risk and ecosystem resilience) and people (job creation, water production and fire risk) that make this

alternative as beneficial. The present Deliverable deals with a project that a semi-arid village (Serra) started years ago to produce and consume its own biomass.

2. Background

On 2012, Serra's municipality started a project to produce and consume biomass derived from gardening residues of the public facilities. Serra collected all these residues (about 1290 Tn), dry them, convert them into pellets and consume it by substituting the heating system of some public buildings. This experience resulted in saving around 19.000 €/yr considering not just the fuel substitution (electric power was substituted by biomass), but also the fact that it was not necessary anymore hiring a company to manage the gardening residues.

After this positive experience, Serra aimed to increase the production, change all heating public system and include forest residues into the pellet processing, as it for sure would increase the quality of the final product. These aims lead to the current biomass management plan of Serra's municipality.

The current biomass management strategy of Serra's municipality yields both economic and environmental benefits. However, there is still significant room for improvement in both the pellet processing and the biomass origin.

3. Objectives

The aim of this deliverable is to identify and describe the potential improvements of the Serra's biomass processing. These improvements must be realistic and if possible, carried out during the project LIFE RESILIENTFORESTS.

4. Methodology

The present Deliverable analysed the previous information about Serra's pellet production in terms of:

- Pellet production
- Machinery
- Plant extension and location
- Biomass origin
- Employees

and proposed potential improvements that will be carried out during the project.

5. Description of the activities

1.- Analysis of the possible improvements in the pellet processing: this analysis was performed by Serra's biomass manager plant and UPV after 3 meetings. During these meetings, the current biomass process was shown and described, and how different machineries would improve this processing.

In the same was, a change of the actual location of the plant was also considered with the aim to increase the production and improve the drying process. In this sense, some locations were studied until the best one was selected. Since this locations is within the limits of the Natural Park, from this moment, this project started the needed preparatory actions to negotiate with the Park authorities.

2.- Analysis of the possible improvements of the pellet quality: this analysis was performed by Serra's biomass manager plant and UPV after 2 meetings, using Deliverable number 2 as basis.

6. Results and conclusion

IMPROVEMENTS IN THE PELLET PROCESSING:

Regarding the pellet processing (quantity), the current and future pellet consumers (main stakeholders in this point) have expressed its interest in increasing the pellet production. Therefore, some improvements will be needed in order to cope with the potential demand. On the one hand, new machinery, such as a pellet rotary dryer, an automatic bagging system and a fork-lift 4x4 (Figure 1), should be included into the drying and packing step to speed up the process and increase the pellet production efficiency. Furthermore, it would also be a significant improvement to change the current plastic packaging for paper bags, which among other benefits, is more ecologic.

Figure 1: Conceptual scheme of a pellet rotary dryer (left), a fork-lift 4x4 (centre) and an automatic bagging system (rigth).

On the other hand, reallocating the processing plant facilities to a bigger place would increase and improve its production (see Figure 2 for current location). There would be enough space to cope with the potential production increase, and the biomass drying phase could be placed indoors, which would significantly reduce the time of this phase, as nowadays it is highly influenced by meteorology. Currently, there is a possible alternative location (Figure 3) with enough space (1000 m^2) to cope with all the increasing expectations, and the project together with the City Hall will try to make the relocation real.

Figure 2: Current location of the biomass plant.

Figure 3: Alternative location of the biomass plant.

IMPROVEMENTS IN THE PELLET QUALITY:

With regards to the biomass origin (and quantity as well), planned biomass harvests in the form of thinning, partial or complete harvests in the Serra's region, can fulfil multiple forest management and resource benefits (Figure 4). In this sense, the current forest management based just on just salvage and sanitation cutting can be significantly improved by designing a proper forest management plan that considers all the management possibilities and not just sanitation. To that end, first the forest existences should be quantified by means of a forest inventory. Subsequently, a management plan

should be designed according to the forest existences obtained in the previous step and the management objectives. Setting the proper management objectives is a key step to optimize the potential benefits, and it will condition the temporal and spatial zoning of forest management. Managing just for biomass, for biomass and timber or for biomass, timber and water might result into a different zoning and different results. Nevertheless, at this point we would like to highlight that during the project demonstration and replication phases, the user will be the one choosing the objectives, and therefore the zoning, and the project will optimize the benefits according to the selected objectives. Of course, some guidelines will be provided to the user, but it is not the project intention to impose the management objectives.

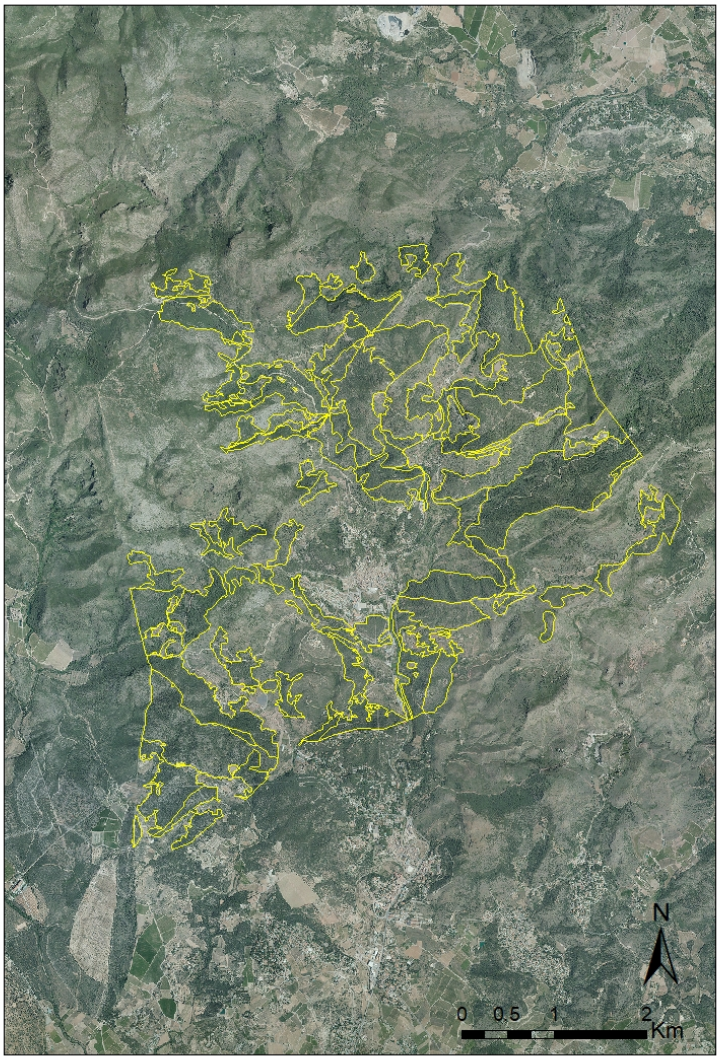

Figure 4: Forest area of Serra's village where biomass extraction would be possible.

In the case of Serra, the best option we consider is to combine biomass, timber, water and fire hazard. In this way, there will be improvements not just I the bio-energy production but in water and fire hazard.

With all these improvements the following benefits would be expected:

- Biomass production increase.
- At least 1 more full time job in the biomass plant to cope with the production increase.
- CO2 emissions decrease.
- Groundwater recharge increase.
- Fire hazard decrease.
- Forest resilience increase.
- Part-time jobs to carry out the forest management.

All these benefits will be examined within the project duration as an indicator of the real project impact.

7. References

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