Centre de la Propietat Forestal

finca fitor

Innovative applied research:

Understorey biomass for Mediterranean forests care

from forest fire protection to energy market at estate scale with Forest Living Lab survey

Joan Botey i Serra

Chemical and Agricultural Engineer

Finca-Fitor

Gavarres – Catalonia - Spain

Brussels, 29 January 2016

Estate characteristics & needs

- Fitor is a forest estate paradigm of Mediterranean climate with mixt cork oak forest about 900 ha and more than 150 km of ways. Ecosystem is exuberant and rich. Understorey growth is about 5 tm/ha/year.
- The sustainable production of understorey biomass for conservation purposes is 4000 tm/year
- Energetic value of understorey is very high, and was the forest energetic source during centuries
- But technological and market barriers must be solved to use this kind of biomass at XXI century.

What is understorey biomass ?

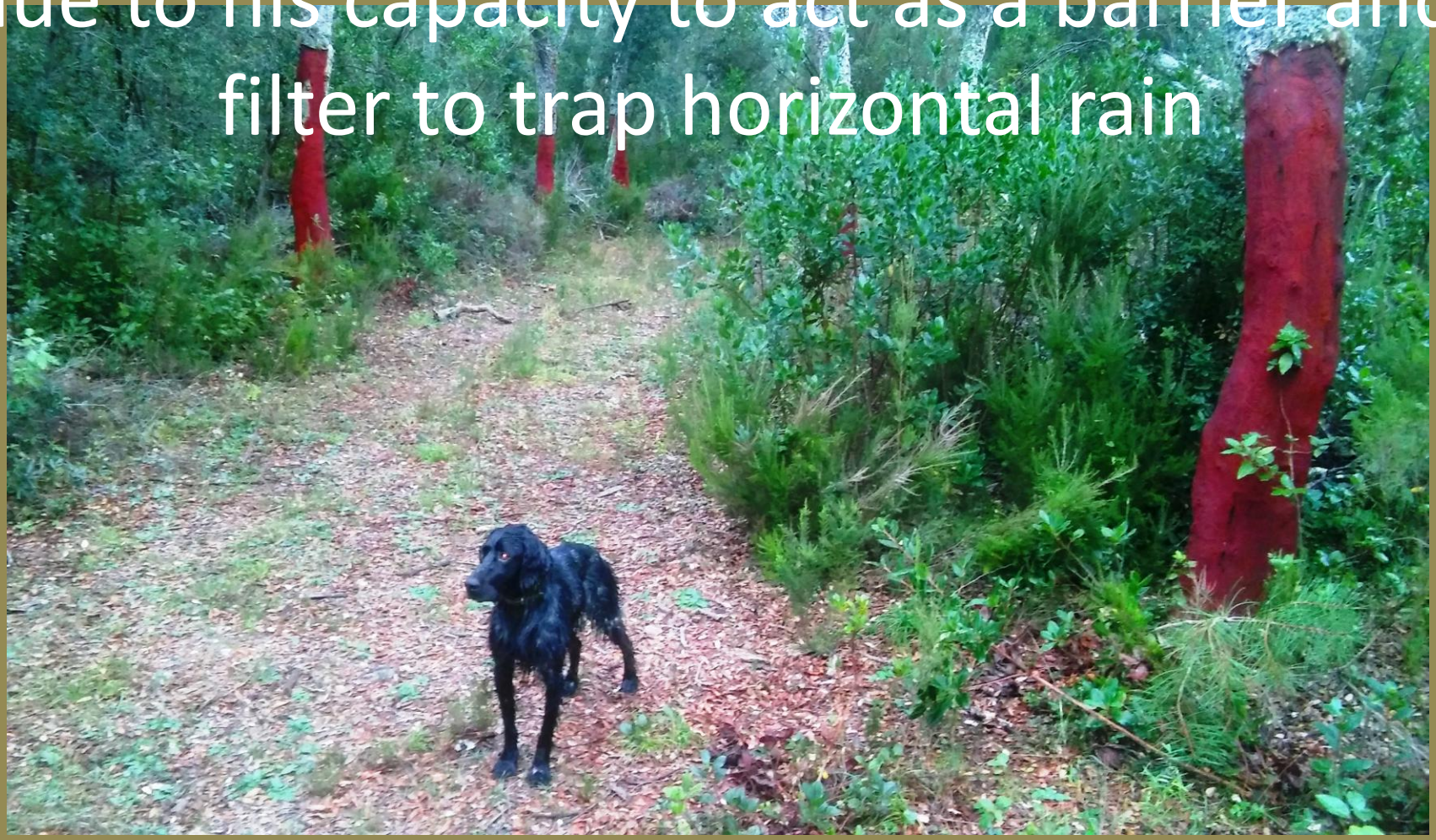
Without actions, understorey is this high barrier of shrubs & bushes competing for water with trees:

Mainly *Arbutus unedo* and *Erica arborea*


If’s not managed is the next
fuel for Forest Fires


Understorey total extraction
is good for trees growth but bad for
humidity conservation into forest

Selective biomass extraction is a form to increase water storage into de forest due to his capacity to act as a barrier and filter to trap horizontal rain



The project

Testing **Innovative Machinery** to manage efficiently low density material (shrubs) in the forest, to harvest, mill and **transform in biotechnological pellets**, trying to let maximum profitability on the estate. Survey, control and transfer by **Forest Living Lab** in the same estate linked with Universities & Research and managed from estate interests.

Project steps

- Creation of a Forest Living Lab on the estate, linked to Universities & Research, for control of applied research managed from the estate.
- Apply new mechanical tools, with innovations, to make possible transport and milling of the understorey into the forest, at competitive cost.
- Harmonisation of shrub extraction with humidity storage in forest. New water Forestry for MF.
- Transform at estate scale rough biomass triturate into a high technology pelleted product. Increasing profitability in estate economy.

1st Step: What's "Forest Living Lab's"?

- Is the fruit to implant bottom/up applied research, from the forest estate interest ideas to improve profitability, and choose Research and University centres to solve it.
- Needs infrastructure to lodge university students on the estate, and tools to study and survey planned research. (Laboratory, bibliotheca, experimental fields, wifi,…)
- With that we have constructed, in the centre of work, a tool for Technology transfer, in line with estates interest, without borders.
- **"FOREST LIVING LAB" has born!**

Forest Living Lab Buiding in Fitor Estate

On Floor.: Laboratory, Bibliotheca, , working zone and presentation zone
1rst Floor: 4 Rooms, Living and Office . Private zone for students/teachers
The annex house, Mas Plaja de Fitor, provides feeding needs to hosts.

Which is the work of Living Lab students under forest manager direction?

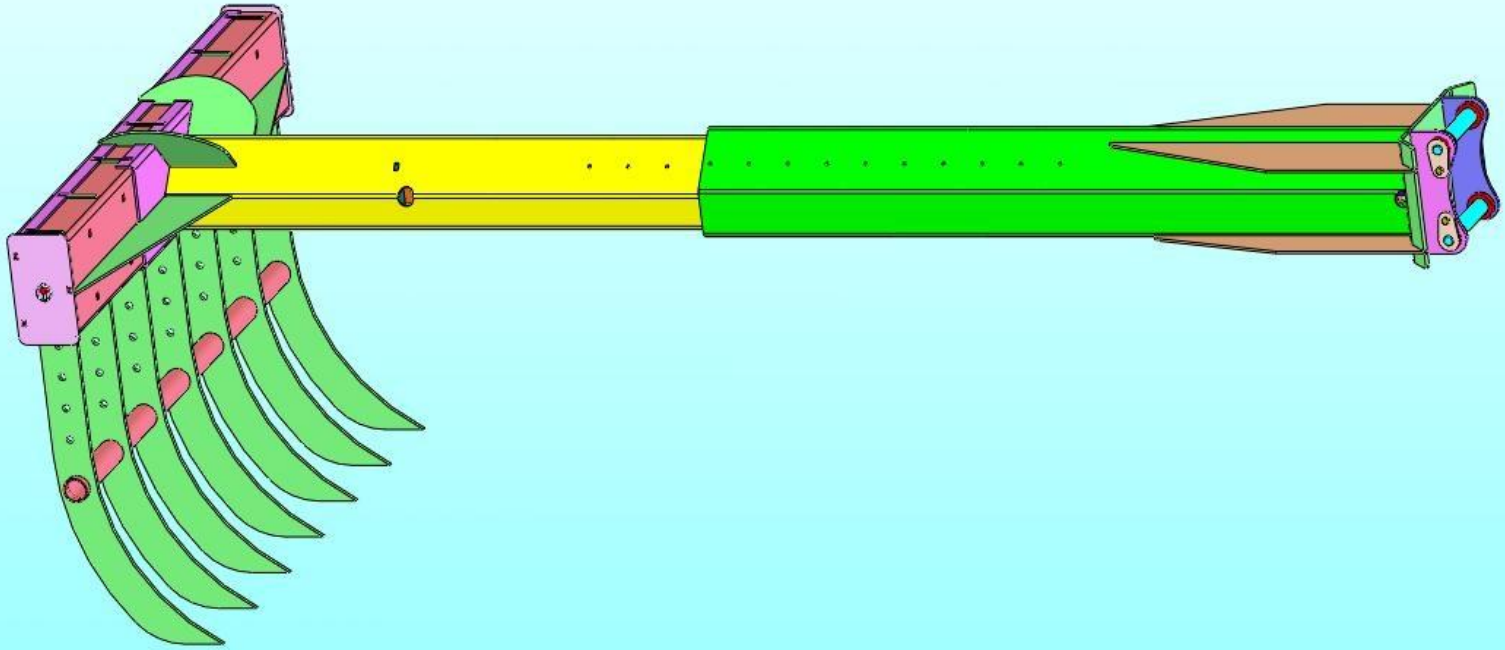
- Survey & control of innovation machinery and new tools to harvest and mill understorey biomass.
- Survey & control 4 experimental fields to test effects of biomass cutting intensity degrees on tº and humidity into the forest.
- Survey & control innovations in Torrefaction plant
- Discussion of results with teachers & manager

2nd Step: Biomass Production

- Material comes from other forestry operations into de mixed forest: cork-oak care, rests of pine cuttings, rests of firewood extractions, roads cuttings. All leaved, sun dry, 10 m beside road.
- After putted on the road by **rake innovation**.
- Milled at the same road with a **two meters wide feeder mill with innovation crane**, and stored in containers. Transport to Industrial Plant in estate.
- Milled, Torrefacted and pelleted at **industrial plant on estate**. Stored there and expended.

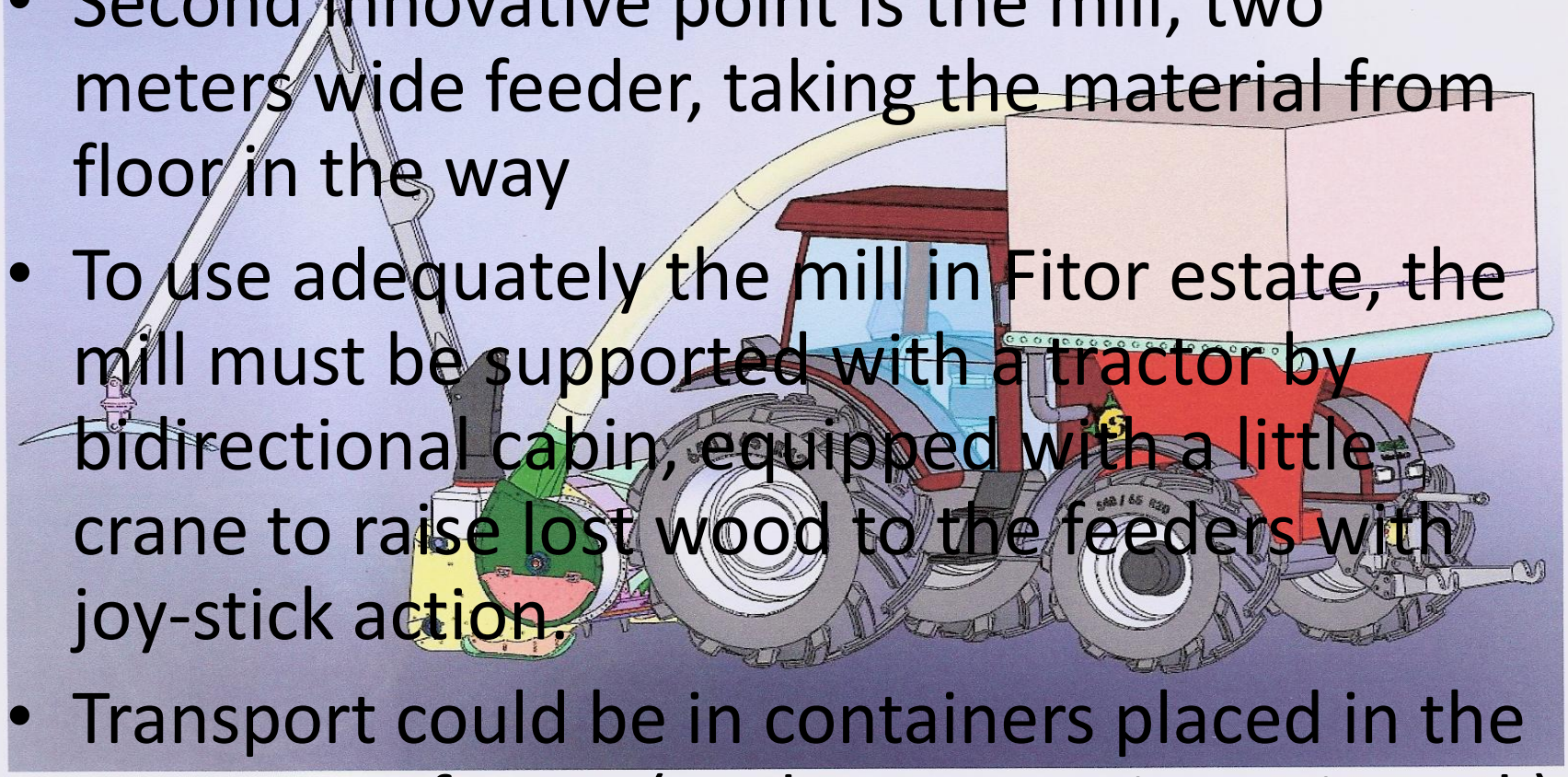
Applying new tools to avoid transports into the forest **MECHANICAL RAKE** of sun dried rough biomass

- To bring the material to the centre of the road is the first innovative point. Because in each rake movement we can bring many material without catch it.
- This point needs many applied research to adjust conditions and tools.



Milling & transport

- Second innovative point is the mill, two meters wide feeder, taking the material from floor in the way
- To use adequately the mill in Fitor estate, the mill must be supported with a tractor by bidirectional cabin, equipped with a little crane to raise lost wood to the feeders with joy-stick action.
- Transport could be in containers placed in the extremes of ways (we have experience in cork)



3th Step: Fine mill, Torrefaction & pellets

A little industrial plant, at estate scale, must be made and connected to electric power or a big generator. Using mainly biomass energy.

- 1st step: reception of forest biomass and fine milling to feed next steep.
- 2nd step: Feeding the Torrefaction Plant, with a production of 1tm/hr
- 3rd step: Feeding a pellet plant, refrigeration and stock

Torrefaction of biomass

- **Properties of the torrefied pellets:**
  - Higher calorific value in comparison with traditional biomass pellets (up to 10%)
  - Hidrofobic and resistent to biological degradation
  - Easily handling, storage and transport

ENERG-bas

UAB
Universitat Autònoma de Barcelona

Main Goals of this Project

- Effective **Forest Fire Prevention** following ECCP
- Introduce to the marked a **new biomass** that is the main fuel of forest fires, and, in a selective shrub cutting form, introduces a **new forestry for water conservation** in Mediterranean forests.
- The **economic profit** of this energetic by-product, after the industrial bio technology applied on final product, is a sustainable form **to survive** for this kind of Forest Estates or his aggrupation's
- Forest Living Lab will be the **technology transfer system** into UE linking Universities and Research.

Impacts of the Project on different workshop fields

- Managing impacts related to Climate Change
  - Effective Forest Fire Prevention for Southern Countries
- Supporting wood & biomass mobilisation
  - Biomass mobilisation without conflict on cascade use. Only energetic value.
- Supporting provision of Ecosystem Services
  - Implements a new forestry for water retention, in a water limiting growth framework for Mediterranean Forests.
- Improving sustainable forest management approaches and tools
  - With the Forest Living Lab idea introduces a new tool for transnational Technology transfer.

finca fitor

Acknowledgements

BioEcoBcn 2014 EFI, ICTA, CPF, CTFC, St. Pau

Specially for the idea and the WG Living Lab's

Mediterranean Forest Week CTFC, UAB, MAGRAMA

Specially for: "Setting-up new projects together"

Knowledge of Dr. Bartrolí UAB and Torrefaction Process

Knowledge of EIP founds for Applied Research

Innovation in Rural Development-AEI 2015

Presentation of EIP founds for innovation in RD

OG: *COSE, SERRAT Trituradoras, CIRCE, ICTA (UAB), ENERGÍES TÉRMIQUES BÀSIQUES SL*

Institut Catala del Suro ***Coordinator:*** *Finca-Fitor* ***Innovation Agent:*** *Albert Botey*

Centre de la Propietat Forestal

jbotey@forestal.cat

www.finca-fitor.com