

Valorising European Research for Innovation in Agriculture and Forestry



VALERIE Stakeholder Trials:

Using LiDAR to inform joint forest management planning with a forest owners group in Roncal, Navarra, Spain

The problem

In many parts of the Pyrenees sustainable forest management had declined in recent decades. Forest ownership is often characterized by small and fragmented plots which are a barrier to economically viable forest management practices and the maintenance and enhancement of biodiversity and ecosystem services. There is an opportunity for forest owners to achieve sustainable management through joint forest management planning. However, a major barrier in the planning process is a lack of empirical data on the physical characteristics of the forest which can be used to inform management. Light Detection and Ranging (LiDAR) is a remote sensing technique that uses laser pulses to survey the surface of the Earth and has the potential to provide much of the required information.

The proposed solution

Gathering empirical data using ground surveys to inform Forest Management Plans can be time consuming and expensive. There is potential to reduce the time and cost of developing Forest Management Plans by using LiDAR data collected through aerial survey to replace some elements of the ground surveys. In this trial, we are implementing the LiDAR technique as an innovation for joint forest management planning. The trial is taking place in Roncal, a valley in the north of Navarra. A meeting in August 2015 identified the forest owners requirements. In April 2016 the LiDAR data was analysed and the first results were used to develop the Forest Management Plan.

Stakeholders

The stakeholders are: individual forest landowners, the local authority, technical staff and forest engineers from the Navarra Forestry Society (Foresna), technical staff from the Mediterranean regional office of the European Forest Institute (Efimed) and the Government of Navarra's technicians and officers responsible for the Roncal area. Meetings have been carried out with forest owners to identify their problems and to show them the proposed innovation. There are also regular meetings with the Government of Navarra's technicians and officers.

Aims and Method

The nature of this trial is scientific demonstration of a new technique in forest planning. The aim is to transform the scientific results obtained from using the LiDAR technique in such a way that they can be included in the Forest Management Plan and be easily understood by stakeholders. The innovative use of LiDAR technology will assist forest owners with the sustainable management of the forest.

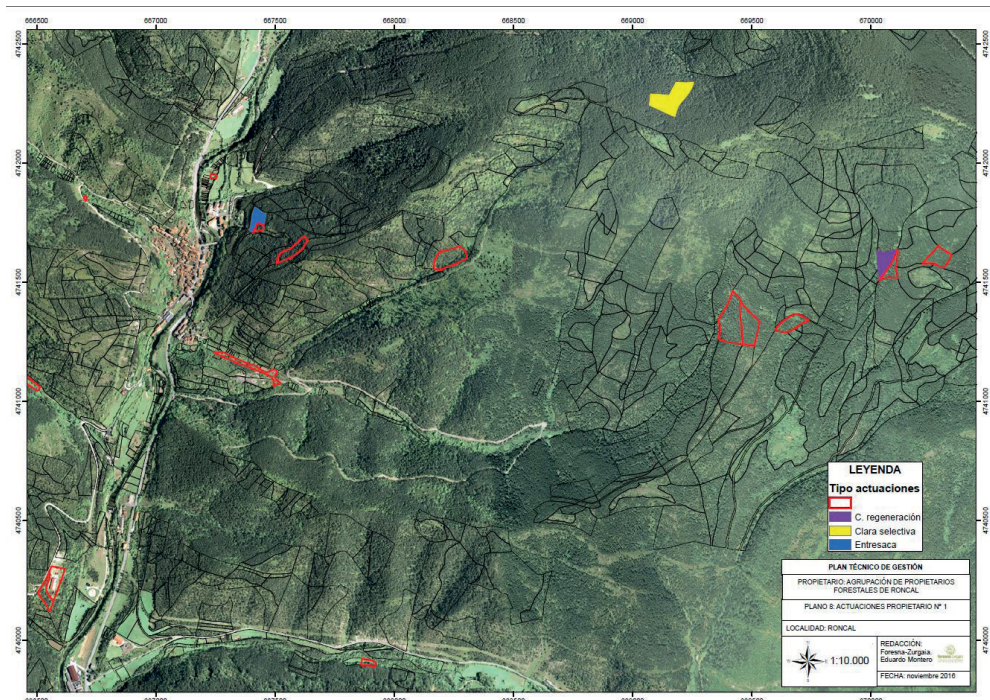
Results

A major advantage of using LiDAR technology for forest planning is that it is cost effective and is able to collect information on forest characteristics without the need for extensive ground surveys.

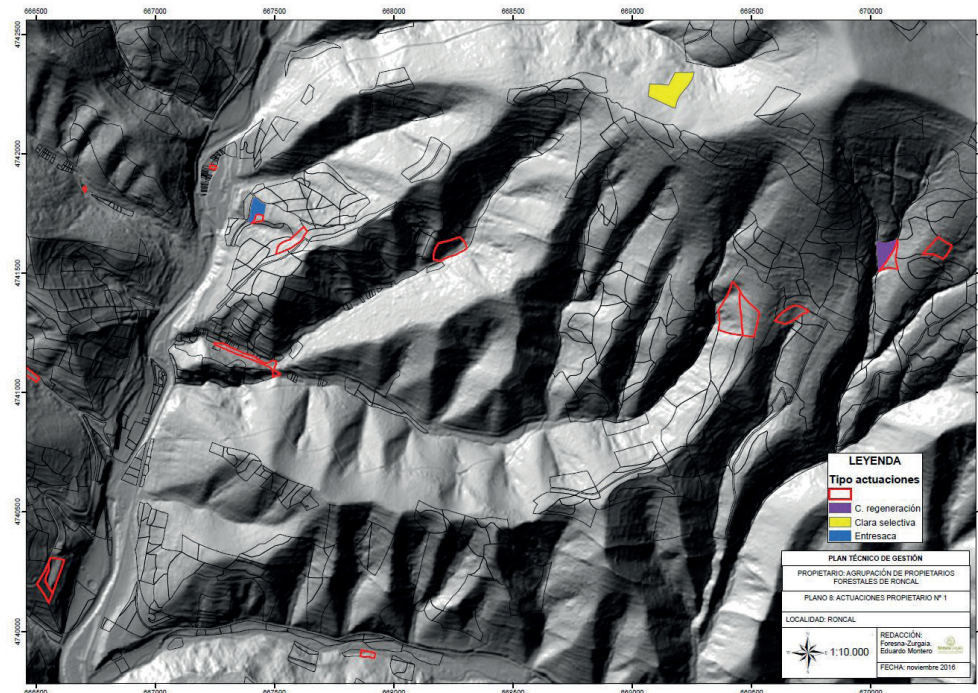
As part of the trial, information has been expressed in a range of different maps and discussed with stakeholders.

For example:

- (Slopes) Map of field slopes
- (Topography) Map of surface condition
- (Ho) Map of tree height
- (Fcc) Map of forest canopy cover



Aerial
Photograph



LiDAR
image

Part of the Roncal study area showing management options for individually owned forest plots

Working with the different maps we have defined 8 types of woodlands depending on their characteristics. This is very helpful as it provides a first idea of the potential of wood production in the different areas of the forest. Using the LiDAR data we can identify the roads that are in use and their type by measuring their width. We can also find the location of old roads that are no longer in use. This is very important because current maps do not provide this information and forest owners have often forgotten where the old roads are located. Knowing the location of old abandoned roads is helpful when planning new roads to improve access to the forest. Using LiDAR it has been possible to inform the forest owners of the quality of their forest and the location of the old forest roads.



This engagement with forest owners is very important in increasing their motivation towards joint forest management and addressing difficult issues such as the need to plan for new roads into the forest and proposed management practice in different parts of the forest.

ESTRATO	i	SUPERFICIE (HA)	15,64	CLAVE TM/C/G/G	1/1/18/40	DESCRIPCION CLAVE	Masas adultas susceptibles de corta final, de regeneración o últimas claras con productos maderables/ Potencialmente productivas / Pinares de pino silvestre / Pinar silvestre						
Descripción: Pinar regular, de origen natural, con un estrato inferior formado por frondosas, como haya, roble, serbal, arce y pies dispersos de acebo. Pinos de grandes dimensiones, en general de buena conformación, rectos y con pocas ramas, aunque en algunas zonas aparecen pies de peores características. Pies padre de buenas características fenotípicas. Abundancia de madera muerta. En algunos puntos de la masa el suelo aparece empujado.													
ESPECIE PRINCIPAL	Pinus sylvestris			OTRAS ESPECIES	Fagus sylvatica, Quercus pubescens, Acer campestre, Sorbus spp., Ilex aquifolium			ESTRATO ARBUSTIVO	Buxus sempervirens (cobertura: 35%) (altura: 2,7 m). Rubus sp. (cobertura: 15%) (altura: 0,5 m).				
ORIGEN	Natural	EDAD/CLASE DE EDAD	70-90 años			VIGOR	Intermedio		DANOS BIOTICOS	AGENTE	PRESENCIA	GRAVEDAD	
PENDIENTE	33%	ORIENTACION	Norte			ROCIDAD	0/0	ESCABROSIDAD	Baja	DANOS ABIOTICOS	AGENTE	PRESENCIA	GRAVEDAD
REGENERACIÓN	ESPECIE	TIPO	LOCALIZACION	POT. SUPERVIVENCIA	POT. REGENERACION	Nº (HA)	ACCESIBILIDAD			Camino estrecho y en mal estado que linda por el este con la masa.			
	Fagus sylvatica	2	1	1	1	111							
	Fagus sylvatica	3	1	2	2	64							
	Quercus pubescens	1	2	1	2	64							

INVENTARIO CUANTITATIVO (datos por hectárea)			
CD (cm)	Nº pies	G (m³)	VCC (m³)
< 10	0	-	-
10-15	0	-	-
15-20	0	-	-
20-25	32	1,27	6,24
25-30	191	11,34	54,66
30-35	159	13,20	81,50
35-40	64	7,03	49,38
40-45	0	-	-
45-50	0	-	-
50-55	0	-	-
TOTAL	446	32,84	191,78

CD (cm)	nº pies/ha	VCC (m³)
<10	0	0
10-15	0	0
15-20	0	0
20-25	32	6,24
25-30	191	54,66
30-35	159	81,50
35-40	64	49,38
40-45	0	0
45-50	0	0
50-55	0	0

LiDAR results contribute to the physical description of individually owned forest plots and are used to inform their future management.

Overall stakeholder involvement and feedback

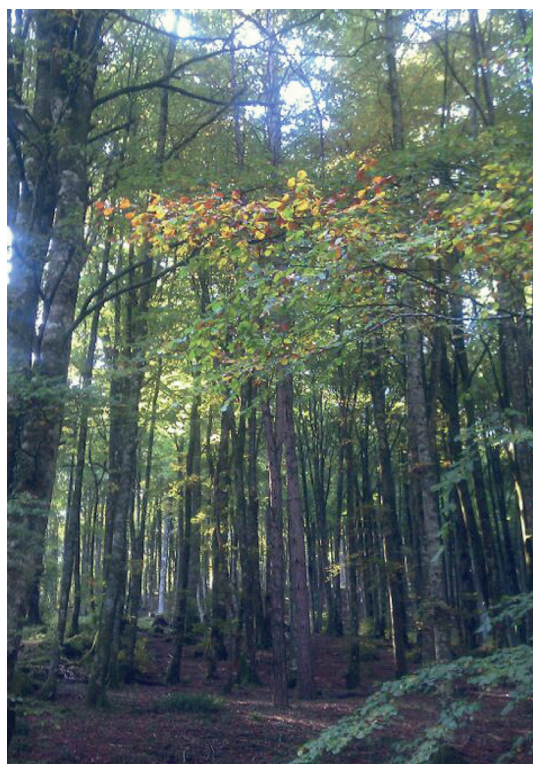
Use of the LiDAR innovation has helped to facilitate joint forest management planning, which can be seen as a social innovation. Stakeholders motivation is higher now than at the beginning of the process. The LiDAR trial is important in engaging stakeholders and sustaining their interest in joint forest management. Holding meetings with stakeholders to discuss the early results from the LiDAR survey was important in maintaining their interest and motivation. Throughout the LiDAR trial, it has been important to keep all the stakeholders informed of the progress being made and to manage expectations.

Stakeholders appreciate the reduction of costs in general planning and the improved planning of access to the forest using the abandoned roads which has resulted from the LiDAR survey. Feedback from stakeholders indicates that joint forest management and the use of LiDAR technology has the potential to improve sustainable forest management and wood production in the Roncal area.

The stakeholders are very interested in the potential of LiDAR technology to provide more information on the characteristics of the forest cover, such as the volume of the trees and a range of other variables needed for further planning. While it is possible for LiDAR to provide this information, more analysis of the data is required using statistical programs supported by ground surveys to validate the results.

Key findings

- The LiDAR survey collected empirical data on the physical characteristics of the forest which was used to inform joint forest management planning in the Roncal area.
- The main problem encountered in using LiDAR in the trial was the technical knowledge needed to understand the LiDAR data.
- Discussion of the early LiDAR results has helped to engage and promote interactions between the forest owners and raise interest in joint forest management.
- When the LiDAR results are used to inform the Forest Management Plan the innovation is helpful for all stakeholders.
- The stakeholders understand the potential of the innovation. There are high expectations that the Forest Management Plan will be able to deliver improvements in forest management. However, this may lead to problems if these expectations cannot be fulfilled.



Acknowledgements

USSE www.usse-eu.org/en/inicio and EFI www.efi.int/portal/ are partners in VALERIE



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