PROJECT I.D.
1.1. Acronym: FERFORE08
1.2. Project title: Rationalisation of the Fertilisation of woodland in the Basque Country
1.3. Financial backers: Basque Government Department of Agriculture, Fisheries and Food
1.4. Participating bodies:
NEIKER DETAILS
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1.6. Start date: 15/01/2008
1.7. End date: 31/12/2008

Summary:

By managing the fertility of the site correctly, we can contribute towards achieving substantial increases in the productivity of forestry plantations. However, this must be attained by using an approach that combines sustainability and profitability.

The project carried out by NEIKER-Tecnalia since 1999 on the nutritional status of *pino insigne* in the Basque Country has allowed us to detect a generalised lack of Phosphorus, frequently a lack of Magnesium and Potassium. Among the micronutrients, deficiencies of Copper and Boron are relatively common.

Different fertilisation treatments have been tested, both in the laboratory and in the field. The preliminary results show significant increases in productivity when correct fertilisation is used. Although the information available at present allows us to significantly improve current fertilisation practices, we undoubtedly need to gather much more information and carry out more studies.

In recent years, fertilisation has become much more generalised among owners of woodland in the Basque Country, but not evenly in all the territories. The Forestry Confederation of the Basque Country estimates that about 50% of the new plantations in Biscay are fertilised in the first year after planting. In Guipuzkoa and Alava, fertilisation is less widespread, although it is increasing. However, fertilisation is very rarely based on qualified technical recommendations. In addition, the fertiliser compounds available on the market are not always ideal for remedying the deficits detected. This makes it even harder for forestry workers to follow technical recommendations.

We therefore face the challenge of generalising fertilisation practices that satisfy the real requirements of plantations, using the scientific knowledge available at any one time. This makes it necessary to improve the tools we have for diagnosis and fertilisation, while increasing the data available. A rational fertilisation strategy should also take into account factors relating to the expected increases in productivity and profitability, as well as any possible environmental effects.

Results:

We have continued to enlarge the database containing the georeferenced analyses of soil and foliar material and now have 1,413 entries.

In 2008, we made 90 fertilisation recommendations based on soil analyses and 26 taking foliar analysis into account. Only in two cases was the foliar material not accompanied by soil samples.

The nutritional diagnoses and fertilisation recommendations were carried out in order to achieve the Sustainable Forestry Management certification covered by the Programme of Endorsement of Forest Certification (PEFC) for 16 management plans. In addition, 2 forest owners sent us their samples, in one case to carry out technically correct fertilisation, and in the other to identify the lack of vigour of their plantation. Thanks to the analyses carried out, we discovered that the *P. radiata* plantation of the same was inadequate: It showed 10.6% of active lime.

In addition, 89% of the recommendations had *Pinus radiata* as their main species, showing its importance in the Basque Forestry Massif and the value that forest owners place on it, being committed to fertilise their mountains correctly, with the cost this involves. The next species of interest in Biscay is the Eucalyptus (both *E. globulus* and *E. Nitens*) and this is

reflected in the number of recommendations made: 5% were for these species. 2% of the recommendations were made for *Pseudotsuga menziesii* and *Pinus nigra*, and 1% for *Abies alba* and *Pinus pinaster*

80% of the soil on which *pino radiata* grows showed a severe deficit of Phosphorus, this being shown in 78% of the foliar material samples. Here, only 5% of the foliar material samples analysed showed adequate levels of Phosphorus. This meant that the most common fertilisation recommendation was to use a fertiliser that offered the following proportions 0270 (N_P_K), in different doses according to the age, density and condition of the plantation: basically of the demand of the biomass when the fertilisation was carried out and the capacity of the soil to deliver the same.

Impact:

The interest of the project lies in continuing to provide a vital service for sustainable management of woodland in the Basque Country. The service is of great importance for the Basque forestry sector, as in order to be awarded the Sustainable Forestry Management certification from the PEFC (a certification that the forestry sector is committed to) it is essential that any necessary fertilisation of woodland is carried out on the basis of a technical report that takes into account the nutritional demands of the vegetation and that offered by the soil itself.

In addition, thanks to this project the NEIKER-Tecnalia database on the nutritional status of commercial woodland in the Basque Country will continue to increase, something of great use in increasing our knowledge of the nutritional deficiencies of woodland in the Basque Country, its geographical distribution and the appropriateness of the recommendations. It will also allow the homogenisation of the different geological classes (the soils of the Basque Country are young and many of their characteristics are linked to lithology) in a lesser number, allowing us to use geostatistics to infer the properties on non-analysed zones and propose the correct management measures for them. The data obtained in this project will allow us, on a regional level, the present data relating to percentages and location of surface areas affected by nutritional deficiencies shown by the development of vegetation and not caused by the nature of the substrate, as required by one of the indicators proposed by the PEFC.