From Forest Nursery Notes, Winter 2010

161. © Prospective use of collected fog water in the restoration of degraded burned areas under dry Mediterranean conditions. Estrela, M. J., Valienta, J. A., Corell, D., Fuentes, D., and Valdecantos, A. Agricultural and Forest Meteorology 149:1896-1906. 2009.

Agricultural and Forest Meteorology 149 (2009) 1896–1906

Contents lists available at ScienceDirect

Agricultural and Forest Meteorology

journal homepage: www.elsevier.com/locate/agrformet

Prospective use of collected fog water in the restoration of degraded burned areas under dry Mediterranean conditions

María J. Estrela [a,b], José A. Valiente [a,*], David Corell [a], David Fuentes [a], Alejandro Valdecantos [a,c]

[a] Fundación CEAM (Fundación Centro de Estudios Ambientales del Mediterráneo), Parque Tecnológico, Calle Charles R. Darwin 14, 46980 Paterna, Valencia, Spain
[b] Departamento de Geografía, Universitat de Valencia, Avda. Blasco Ibañez 28, 46010 Valencia, Spain
[c] Departamento Ecosistemas Agroforestales, Escuela Politécnica Superior de Gandía, Universitat Politécnica de Valencia, Ctra Nazaret-Oliva s/n, 46730 Gandía, Spain

ARTICLE INFO

Article history:
Received 26 November 2008
Received in revised form 19 June 2009
Accepted 23 June 2009

Keywords:
Passive fog collection
Valencia region
Reforestation
Micro-irrigation

ABSTRACT

A mountainous plot located in the interior of the Valencia region (east coast of the Iberian Peninsula) was identified for reforestation using the fog-water collection potential prevailing in the area. Fog data were obtained by means of an instrument ensemble consisting of a passive cylindrical fog-water collector, a rain gauge, a wind direction and velocity sensor and a temperature and humidity probe. Preliminary results gave rise to the additional deployment of a low-cost 18-m^2 flat-panel collector connected to three 1000-l tanks for larger scale fog-water collection and storage. The 2007 annual rate of fog water that could be derived from the instrument ensemble amounted to 3.3 l/m^2/day, which turn out to fill up the storage tanks completely in only 5 months, even though the flat-panel collector could not be operative 100% of the time. The study made use of the *in situ* stored water and a micro-irrigation network to irrigate a plot of reforestation seedlings through small water pulses localized deep in the planting hole during the summer dry period. Until the present, this forest location had always shown a difficult self-recovery due to the high level of land degradation resulting from recurrent forest fires in the past. Results indicate that survival rates and seedling performance of the two species planted, *Pinus pinaster* and *Quercus ilex*, improved with the use of small timely waterings and additional treatments with composted biosolid.

1. Introduction

The Mediterranean basin, climatologically characterised by dry and hot summers followed by wet and mild winters, presents important problems in relation to water resources. Traditionally, water had been considered a practically unlimited natural resource, and many Mediterranean countries saw it as a permanently supplied product irrespective of season and/or drought variability. In recent years, however, this mentality has changed to the point of recognizing water resources as a valuable good. Population rise, coastal overcrowding, high human consumption, irrigated crop expansion, excessive exploitation of aquifers, among others, are the causes of water scarcity in most of the Spanish Mediterranean coastal regions. According to the Water Framework Directive (Kaika, 2003), i.e. Directive 2000/60/EC of the European Parliament and of the Council of 23rd October 2000, which establishes a framework for Community action in the field of water policy (DOCE L327/1 22.12.2000), excessive exploitation has led to water being considered rather like a heritage which must be protected, defended and treated as such. In Spain, temporary legal restrictions on water consumption had to be adopted in the summer of 2003 in the regions of Valencia and Murcia and in the summer of 2005 in Andalusia. In fact, the water situation has reached the extreme of establishing a Drought National Observatory as a centre for the monitoring, knowledge, anticipation and mitigation of drought effects in Spain.

The Valencia region, where the study area is located, is situated in the centre of the Spanish Mediterranean coast (Fig. 1). Its annual pluviometric regime ranging from 400 to 600 mm, with a dependence on topography, results in typical conditions for a dry climate (Peñarrocha, 1994) and categorizes the region as belonging to the dry part of Spain. In addition, studies on rainfall modifications due to climate change (Quereda et al., 1996; Montón and Quereda, 1997; Millán et al., 2005a,b) predict a negative trend in precipitation in the southern part of the Iberian Peninsula, more accentuated towards the East and the South. Within this context of water scarcity, the quantification and assessment of any of the inputs in the hydrological system is basic for responsible water management in the framework of a sustainable environment and society. In this line, fog water harvesting has aroused scientific interest for its various applications in Mediterranean areas where water is limited. The coastal regions of eastern Spain meet most of the geographical conditions for fog occurrence and collection potential, as compiled by Schemenauer and Cereceda (1994b). The

* Corresponding author. Tel.: +34 96 1318227; fax: +34 96 1318190.
E-mail address: josean@ceam.es (J.A. Valiente).

0168-1923/$ – see front matter © 2009 Elsevier B.V. All rights reserved.
doi:10.1016/j.agrformet.2009.06.016