

Getting forests ready for future climate: Europe is looking for suitable tree species for assisted migration

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The issue

A warmer climate with drier summers will affect the climatic suitability of tree species in their current habitat and, subsequently, future forest ecosystem services. On many forest sites, other tree species, than those currently in place, will grow better towards the end of the 21st century. Climate change will allow tree species to colonize new habitat, but natural migration rates are slow. In the context of assisted migration, many countries have started to test tree species on sites where the climate is projected to suit them towards the end of the century. Here, we give an overview of initiatives in different European countries and encourage collaboration.



Exotic species trial site in Mutrux CH, Photo: SRF

The approaches

While some experiments (Experimental Plantations, ESPERENSE, REINFFORCE, Exotic species trial) focus on single tree growth and mortality and test tree species over broad climatic gradients, others focus on the stand level and test different tree species compositions at the dry end of the climatic gradient (BIOTREE, Climate Match, FORBIO, Satakunta). Overall, experiments are conducted on 118 sites.

Tree species and provenances

As expected the list of the tree species tested is very long. The species included in most of the projects is *Quercus petraea* (6 projects) followed by *Quercus robur* (5), *Pinus sylvestris* (5), *Pseudotsuga menziesii* (5), *Fagus sylvatica* (4), *Acer pseudoplatanus* (3) and *Cedrus atlantica* (3). *Pinus* and *Quercus* are the genera tested most often with up to 10 different species per genus. ESPERENSE and REINFFORCE are further testing a whole range of non-native tree species from other continents such as *Eucalyptus gunnii*, *Liquidambar styraciflua*, *Calocedrus decurrens*, *Thuja plicata* and *Sequoia sempervirens*. The number of provenances tested varies from 1 to 7 per species in the different experiments.



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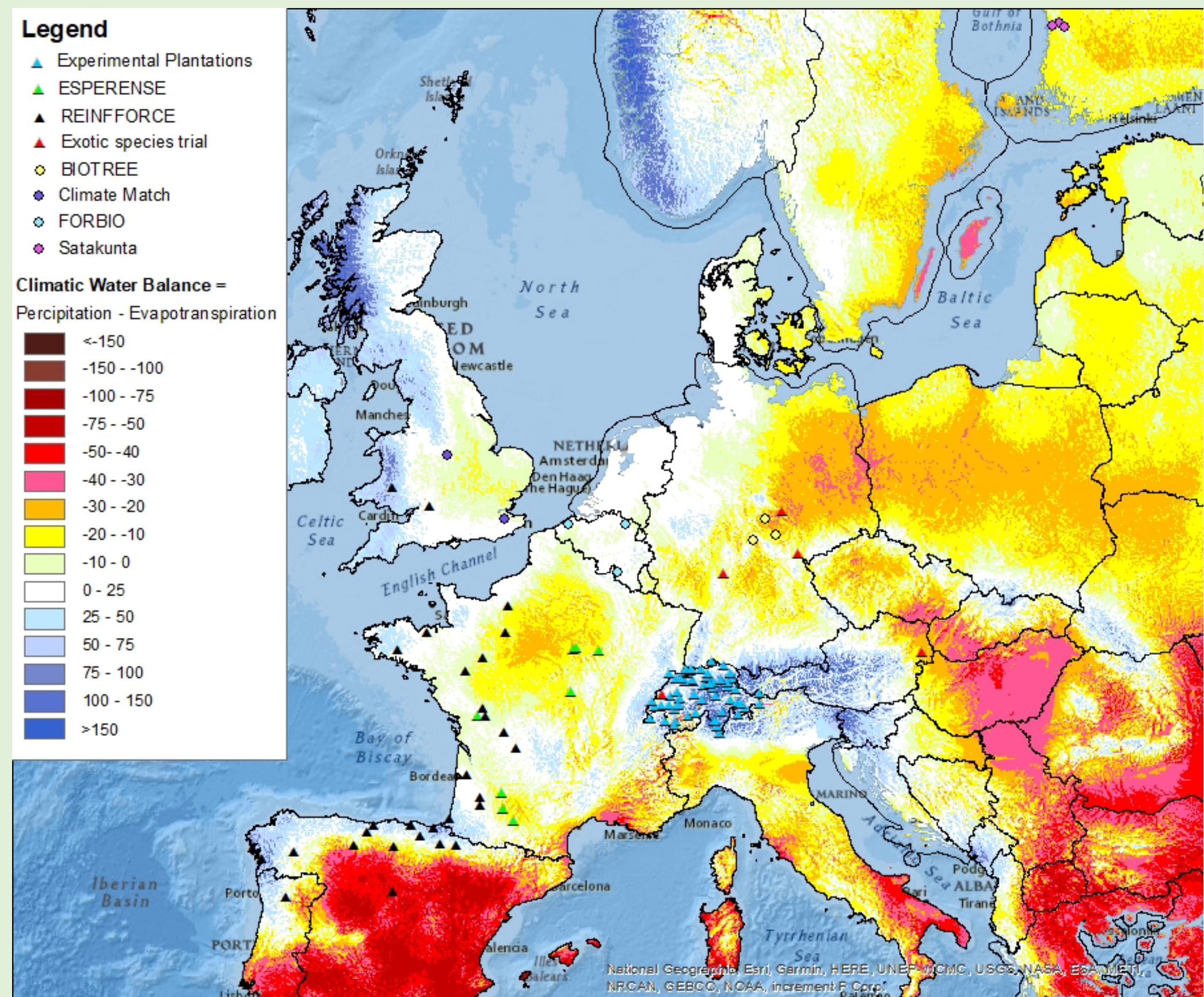


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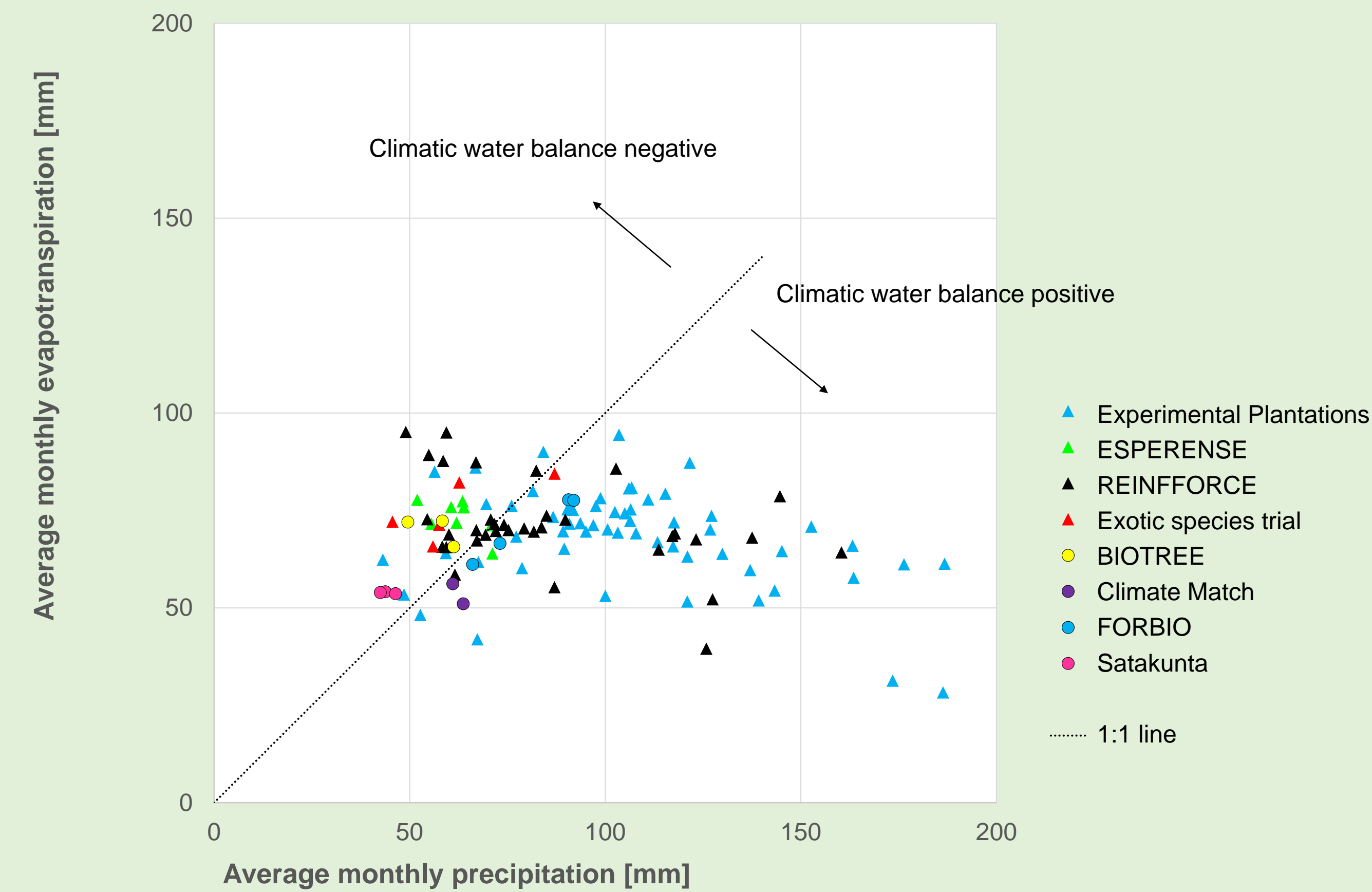
Overview of climate suitability trials for tree species in Europe (GU stands for genetic units or provenances, E_{yr} for Year of establishment)

Name of project	Country	# of sites	# of species	# of GU	# of plants	E _{yr}	Experiment	Agencies
Experimental plantations	CH	59	19	120	55000	2020	single tree	WSL, FOEN, cantons
ESPERENSE	F	8	30	60	20000	2020	single tree	ONF, INRA, CNPF, FCBA, Irstea
REINFFORCE	F, E, P, GB	38	38	114	100000	2012	single tree	IEFC & EFIATLANTIC partners
Exotic species trial	CH, D, A	5	8	8	25000	2012	single tree	LWF, WSL, Forest Thuringia, BOKU, Uni Bayreuth
BIOTREE	D	3	16	16	200000	2003	stand	University of Freiburg
Climate Match	GB	2	4	12	6000	2011	stand	GB Government Forest Research
FORBIO	B	4	10	ca. 14	100000	2010	stand	different Belgian universities
Satakunta	FIN	3	6	ca. 10	24000	1999	stand	University of Turku, RHUL

Experimental sites and climatic water balance
Symbols indicate projects



Climatic water balance during the growing season (months with mean temperature above 5°C) of 118 sites in 8 projects: Average monthly precipitation vs. average monthly evapotranspiration after Turk



Conclusions

Recent parallel activities to create networks of field tests of suitable species and provenances offer opportunities for international cooperation. This would help to overcome problems in seed provision and set-up of the plantations, and enable the use of synergies by common measurement protocols and combined analyses. If you are interested in creating a network in this field of research, contact us under testpflanzungen@wsl.ch