Update experiments Groasis Waterboxx Spain

August 2010

The saplings planted with the Groasis Waterboxx (WB) during this year's experiments in Spain have in their great majority survived this year's brutal summer heat and lack of rain in many regions. These spectacular results were observed during a review at the end of August by the Groasis team.

The Groasis Waterboxx (WB) was officially launched in Matallana, Valladolid on the 20th of April 2010. A number of Spanish organisations signed up to participate in a series of experiments in different regions, as a precursor for the Life+ project that will eventually see the planting of close to 30.000 WBs in 5 regions, starting early 2011.

During this year's experiments, close to 4.000 WBs were planted in 12 different areas during the months of May, June and July. The soil chosen by the participants was the most complicated for trees: heavy clay soil that dries and hardens out completely in summer and chokes the roots. A large variety of tree types was planted, including different species of oak and pines, chestnut, etc. On the 24-26 of August 2010, Pieter Hoff (inventor) together with Sven Kallen and Egbert Sonneveld (representatives of Groasis Spain), visited 10 experiments to witness firsthand the results of these plantings and learn important lessons for the product's improvement.

500 WB planted in Los Monegros desert (Zaragoza)

Condensation effect on top of the Waterboxx

Preliminary conclusions:

On the last page of this report detailed results of each visited project are shown. They are very positive and all pilot projects show better than expected test results:

- Close to 100% surviving trees in those WB that were planted in the correct way and with healthy saplings.
- Almost all saplings show growth in their top leaves indicating good health.
- Those saplings that were higher than 25 cm (height of the WB) showed in some cases burned leaves due to the intense summer sun, however, all showed new sprouts below or even above the top level of the WB.
- All boxes that were originally filled with water still retain 40 to 70% of the original volume of water, even after the hot summer and in those places without rain.

- In those regions that have seen occasional rain in the summer months (Aragón and Catalonia) the boxes are fully replenished.
- In Zamora where it did not rain a single drop during the summer the boxes were also half full to full, indicating the condensation effect as the source for replenishment.
- The temperature below the box measured between 2 till 10 degrees lower than the soil outside the WB during the day and between 1 till 2 degrees higher than the soil outside the box during the early morning. This confirms the excellent isolation effect of the WB, protecting the plants from excessive heat during the day and excessive cold during the night/mornings.

250 WB were planted at Matallana (Valladolid)

Soil temperature measurement next to the WB

Measurements at Los Monegros (Zaragoza)

Soil temperature measurement below the WB

- One test area receives special mention as it is a mining waste dump. Earlier reforestation projects proved unsuccessful with all saplings dying, even with regular watering. At this particular project 100 WB were planted, each with 2 oak saplings at the end of July. Not only did all plants survive the scorching heat of the August month, but they are all growing already.
- The control groups that were planted in most experiments all died were, except for those that received (daily) watering. In the latter case the plants did not grow at all, indicating mere survival but no rooting.

80 WB planted in very dry area of León

100 WB planted on top of mining waste

New sprouts at mining dump plantation

Control group not growing, despite watering

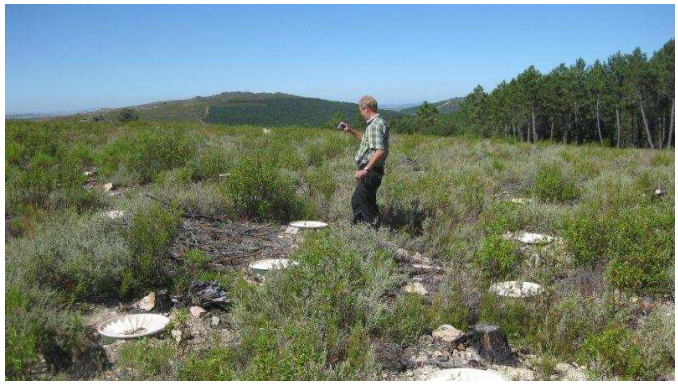
Lessons learned:

- Importance of positioning the WB correctly (i.e. horizontal, with a flat surface under the WB to avoid bending, facing north, correct positioning of wick and carton, and 5 to 10 cm deep in the soil).
- Importance of using young saplings with original radicle [or *pen root*] intact and that have come straight from the nursery.
- In case of seeding, probably preference for using pre-germinated seeds to avoid damage to the pen root.
- Importance of monitoring plantings for possible ants or other animals, such as moles, that can attack the root system.
- The design of the WB could include a better closing of the top cover (in the middle part), offer a larger carton below the box to prevent drying, create more 'plug & play' features of individual pieces to prevent mistakes during assembly.

It is still early to make any final conclusions; however, preliminary test results indicate very high survival rates, immediate rooting and growth of top leaves and clear cooling effect of the WB during the day and vice-versa during the night.

The current experiments will regularly be monitored in situ by our local counterparts where possible the data will be registered on the Groasis web page and will be visited again at the end of October to check for any new developments.

Green pine sprouts at Los Monegros



Observation of experiments at Riofrío de Aliste (Zamora)

2 growing pines inside WB at Astudillo (Palencia)

In collaboration with:

More information: www.groasis.es, info@groasis.es

Castelltallat (Manresa)	Application	Date plantation	Day control, hour	Temp air	WB planted	Saplings	Dead	Temp outside	Temp lateral	Temp below	Temp water	Explications / Observations
Terrain 1	Reforest dry terrain, both plain and hilly	15/05/2010	24/8/2010, 12:00 h	29,5	44	88	1	38 32	23,2 24,2	22,4 23,7	22,3 23,5	Sapling without root
Terrain 2	Reforest dry terrain, hilly				35	70	0	27,3	23	21,4	25,4	
Terrain 3	Reforest dry terrain, plain				26	52	0	N.a.	N.a.	N.a.	N.a.	Burned leaves but sprouting below
San Mateo de Gállego (Zaragoza)	**Application**	**Date plantation**	**Day control, hour**	**Temp air**	**WB planted**	**Saplings**	**Dead**	**Temp outside**	**Temp lateral**	**Temp below**	**Temp water**	**Explanations / Observations**
Terrain 1	Reforest dry terrain, both plain and hilly	25/06/2010	24/8/2010, 18:00h	32,8	440	480	12	31 33,1	30,2 29,6	26,3 26,8	31 29,7	Old saplings were used and planted long after they were withdrawn from nursery. Too much time between the drilling of the hole and planting (clay dried out) Planting staff not schooled/motivated
Mattallana (Valladolid)	**Application**	**Date plantation**	**Day control, hour**	**Temp air**	**WB planted**	**Saplings**	**Dead**	**Temp outside**	**Temp lateral**	**Temp below**	**Temp water**	**Explanations / Observations**
Terrain 1	Reforest dry terrain, plain	01/07/2010	25/8/2010, 08:00h	12,9	80	80	2	21,5	21,7	23,1	18,9	Roots attacked by animals
Terrain 2	Reforest dry terrain, hilly		25/8/2010, 08:30h	19,5	80	80	1	22,3 21,6	20,6 21,8	22,9 22,7	20 20,1	No explanation
Terrain 3	Reforest dry terrain, plain		25/8/2010, 09:00h	21,2	80	80	20	21,2 19,7	21,3 20,2	22,4 21,5	18,5 19	Roots attacked by animals
Medina de Rioseco (Valladolid)	**Application**	**Date plantation**	**Day control, hour**	**Temp air**	**WB planted**	**Saplings**	**Dead**	**Temp outside**	**Temp lateral**	**Temp below**	**Temp water**	**Explanations / Observations**
Terrain 1	Restoration of land limits	11/07/2010	25/8/2010, 10:00h	25,6	20	20	0	20,7	19,8	21,8	19,9	
Riofrío de Aliste (Zamora)	**Application**	**Date plantation**	**Day control, hour**	**Temp air**	**WB planted**	**Saplings**	**Dead**	**Temp outside**	**Temp lateral**	**Temp below**	**Temp water**	**Explanations / Observations**
Terrain 1	Restoration after forest fire in 2006	20/06/2010	25/8/2010, 12:30h	30,1	700	700	3	23,2	22,7	20,2	19,5	Old saplings were used
León (León)	**Application**	**Date plantation**	**Day control, hour**	**Temp air**	**WB planted**	**Saplings**	**Dead**	**Temp outside**	**Temp lateral**	**Temp below**	**Temp water**	**Explanations / Observations**
Terrain 1	Reforest dry terrain, both plain and hilly	29/07/20010	25/8/2010, 15:30h	33,1	80	80	21	31,4 32,1	25,9 26,2	24,5 23,2	27 27,8	As an experiment 20 WB were NOT filled with water: saplings died.
						in SHADOW:		21,3	21,3	18,9	21,1	WB planted in shadow
Guardo (Palencia)	**Application**	**Date plantation**	**Day control, hour**	**Temp air**	**WB planted**	**Saplings**	**Dead**	**Temp outside**	**Temp lateral**	**Temp below**	**Temp water**	**Explanations / Observations**
Terrain 1	Restore wasteland of carbon mines	25/07/2010	25/8/2010, 18:30h	30,8	100	200	0	33,4	26,5	23,1	27,9	Test group alive due to daily watering but not growing. All WB plant growing well.
Astudillo (Palencia)	**Application**	**Date plantation**	**Day control, hour**	**Temp air**	**WB planted**	**Saplings**	**Dead**	**Temp outside**	**Temp lateral**	**Temp below**	**Temp water**	**Explanations / Observations**
Terrain 1	Reforest dry terrain, plain	July 2010	01/9/2010, 07:45h	13,5	20	40	0	16,5	16	18,8	16,5	Extremely dry summer
Grijota (Palencia)	**Application**	**Date plantation**	**Day control, hour**	**Temp air**	**WB planted**	**Saplings**	**Dead**	**Temp outside**	**Temp lateral**	**Temp below**	**Temp water**	**Explanations / Observations**
Terrain 1	Private garden	May 2010	01/9/2010, 08:30h	14,0	5	10	0	15,9	15,5	16,8	16,4	-

No temperature measurements could be taken at the **Sant Martí de Llémena (Girona)** project. Close to 40 WB were planted on the 27th of July 2010.

Except for 2 saplings that were of low quality indeed died, all other plants are living and growing

N.a = Not Available. In case 2 temperatures are shown in a cell this means 2 measurements were taken at different spots within the same terrain.