

1. INTRODUCTION	2
PLANTING METHOD WITH GROASIS WATERBOXX	
2. TECHNOLOGY	3
3. PARAMETERS OF ANNUAL TEMPERATURE AND PRECIPITATION	6
3.1 Open field and radiation.....	6
3.2 Annual precipitation.....	6
4. THE RESULTS	8
Tamarind (<i>Tamarindus indica</i>).....	9
Cashew (<i>Anacardium occidental</i>).....	9
Avocado (<i>Persea americana</i>).....	10
Sapodilla (<i>Manilkara zapota</i>).....	11
Tangerine (<i>Citrus nobilis</i>).....	12
Custard (<i>Annona cherimola</i>).....	13
Cherry (<i>Prunus avium</i>).....	14
Guava (<i>Inga edulis</i>).....	15
Rose apple (<i>Syzygium jambos</i>).....	16
Almond (<i>Prunus amigdalus</i>).....	17
Mango (<i>Mangifera indica</i>).....	18
Orange (<i>Citrus sinensis</i>).....	19
Lemon (<i>Citrus lemon</i>).....	20
Soursop (<i>Annona muricata</i>).....	21
5. TIMBER TREE PLANTING	22
Yellow (<i>Tabebuia cahracea</i>).....	22
Guaiac (<i>Tabebuia chrysantha</i>).....	23
Saman (<i>Samanea saman</i>).....	24
Mahogany (<i>Switenia candollei</i>).....	25
Melina (<i>Gmelina arborea</i>).....	26
Lignum Vitae (<i>Bursera graveolens</i>).....	27
Laurel (<i>Laurus nobilis</i>).....	28
Ebony (<i>Dyospyros ebenum</i>).....	29
6. GRAPES	30
7. FAQ	31
8. RESULTS	32
9. CONCLUSIONS	32



**FUENTE DE VIDA FOUNDATION
'AGUA VIDA NATURALEZA PROJECT'
ACTIVITIES REPORT OF FRUIT TREES AND TIMBER TREES**

1. INTRODUCTION

'Fuente de Vida' Foundation is organizing the 'Agua Vida Naturaleza' Project in cooperation with the University of the Peninsula of Santa Elena (UPSE), Ecuador. The Project is funded by COMON Foundation from The Netherlands. Since March 2012 trees, fruits, timber, as well as vegetables have been planted using the Groasis Technology, including the Groasis Waterboxx.

The objective of the 'Agua, Vida y Naturaleza' Project is to research if it is possible to grow trees with over 90% less water use and to grow vegetables with at least 70% less water use. The Project also focuses on the development of a greenhouse that is inside colder than the outside temperature, while using no energy to cool it. The issue of water scarcity is important in Ecuador, and all over the world. The Groasis Technology might be an important instrument to help solve this issue.

The Project consists of 3 phases:

Phase 1: first year of research in the greenhouses on the premises of UPSE in Rio Verde, Santa Elena, Ecuador.

Phase 2: introduce the Groasis Technology in 7 dry areas all over Ecuador if the first phase has brought a good result.

Phase 3: develop a financial model so that growers can easily finance and use the Groasis Technology, and combine that with training.

The Project is currently in Phase 2.

We believe that the research Project we execute is a role model for Santa Elena Province and our country. It brings many advantages that can be used in the nearby future. The results will be a national and international reference, thus fulfilling the major objectives of the Waterboxx inventor Mr. Pieter Hoff, which is to reforest the world using less water.

2. PLANTING METHOD WITH GROASIS WATERBOXX TECHNOLOGY

- Make a hole with a depth of 15 cm deep and 60 cm wide, and do not break the capillarity of the soil, as it helps the roots to find water at a depth of 3 meter.



- Then put 20 liters of water in clay ground and 40 liters in sandy ground, and let the water seep in during 24 hours. Then check the roots and cut all the horizontal parts off. Then plant it.





- Then we prune all unnecessary shoots and leaves, and cut the main trunk to 20 cm maximum length. We do this to prevent evaporation.
- Place the plant without using pressure to compact the soil. The compacting is done with water.
- After the planting process the white anti-evaporation cover is placed. Then, the Groasis Waterboxx is placed over the tree. The opening must be placed in east-west orientation, in order to avoid sunlight directly reaching the plant.
- 4 liters of water is distributed directly to the plant and 16 liters in the box.
- See 15 instruction videos in 11 languages here:
<http://www.youtube.com/user/Groasiswaterboxx>
 You can also find a printed manual at:
<http://www.groasis.com/en/technology/groasis-waterboxx-manual>
- Or use the planting instruction app that is available in 10 languages

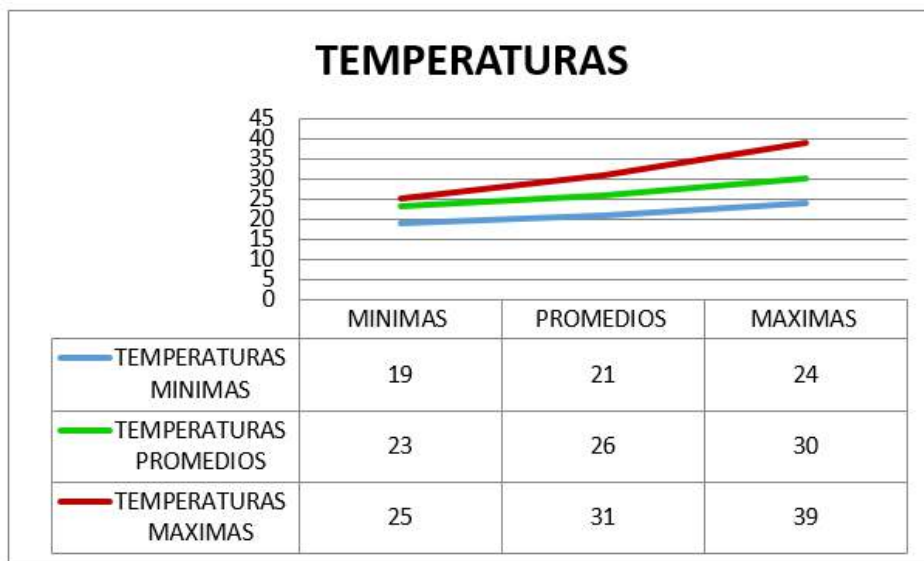
Manual planting
 Manual de siembra
 种植手册
 手冊种植
 Manualo (sa: spondaj)
 मनुअल रोपण
 El dhalin
 Manual para plantar
 Enakli de plantar
 种植手册





3. PARAMETERS OF TEMPERATURE AND ANNUAL PRECIPITATION

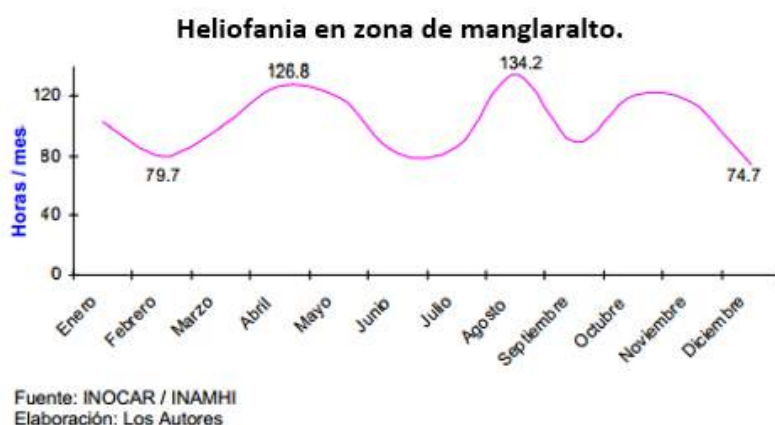
3.1 OPEN FIELD AND RADIATION



Graphic 1

During this year, from March 2012 to March 2013, the open field had maximum temperatures up to 39,5°C and minimum temperatures of 19,2°C as shown in graph 1. Ecuador has the world's highest radiation <http://www.exa.ec/bp21/index-en.html> .

Manglaralto area (Santa Elena Peninsula), has determined that the total hours of annual sunshine totals 1231.1 hours, representing a monthly average of 102.6 hours / month (3.9 hours per day). Source: <http://www.dspace.espol.edu.ec/bitstream/123456789/3744/1/6271.pdf> (page 161). As graphic 2 shows.



Graphic 2

Green Rio commune to submit dry climate the daylight hours are more intense than Manglaralto, with approximate average of 5 hours light / day.

3.2 ANNUAL PRECIPITATION

Table 1. Annual Precipitation in Rio Verde.

Meses	Precipitación mm
Enero	0
Febrero	125,4
Marzo	58,6
Abril	26,2
Mayo	1,1
Junio	0
Julio	0
Agosto	0
Septiembre	0
Octubre	0,3
Noviembre	0
Diciembre	0
Total	211,6 mm

Table 1, indicates that between January and December 2012 there was a total rainfall of 211,6mm

4. THE RESULTS

TAMARIND (*Tamarindus indica*)



Planting date:	Jun 12th 2012
Monitoring Date:	Jul 30 th , 2013
Number of plantings	65 plants
Survival%:	64 live plants (1 dead), 98%
Based Fertilization:	Complete fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	33 cm
→ July 15th 2013	110 cm
Stem diameter:	3 cm
Crown diameter:	86 cm

CASHEW (*Anacardium occidentale*)

Before



Now



Planting date:	Jun 18 2012
Monitoring Date:	July 30, 2013
Number of plantings:	39 plantings
Survival%:	37 living (2 dead). 95%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	35 cm
→ July 15th 2013	108 cm
Stem diameter:	6 cm
Crown diameter:	70 cm
emoving waterboxx:	July 3, 2013

AVOCADO (*Persea americana*)

Before



Now



Planting date:	August 17 2012
Current date:	July 30, 2013
Number of plantings:	50 plants.
Survival%:	22 live plants (28 dead). 44%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	33 cm
→ July 15th 2013	88 cm
Stem diameter:	4 cm
Crown diameter:	22 cm

SAPODILLA (*Manilkara zapota*)

Before

Now



Planting date:	Jun 27th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	39 plants
Survival%:	34 live plants (five dead). 87%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	31 cm
→ July 15th 2013	57 cm
Stem diameter:	3 cm
Crown diameter:	30 cm

TANGERINE (*Citrus nobilis*)

Before



Now



Planting date:	Jun 12th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	39 plants
Survival%:	38 live plants (1 dead). 92%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	29 cm
→ July 15th 2013	102 cm
Stem diameter:	3 cm
Crown diameter:	40 cm

CUSTARD (*Annona cherimola*)

Before



Now



Planting date:	Jun 13th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	42 plants
Survival%:	42 plants. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	31 cm
→ July 15th 2013	113 cm
Stem diameter:	3 cm
Crown diameter:	40 cm

CHERRY (*Prunus avium*)

Before



Now



Planting date:	Jun 13th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	31 plants
Survival%:	30 live plants (1 dead). 97%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	25 cm
→ July 15th 2013	192 cm
Stem diameter:	7 cm
Crown diameter:	88 cm

GUAVA (*Inga edulis*)

Before

Now



Planting date:	Jun 18th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	46 plants
Survival%:	29 live plants (17 dead). 63%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	31 cm
→ July 15th 2013	112 cm
Stem diameter:	5 cm
Crown diameter:	60 cm

ROSE APPLE (*Syzygium jambos*)
Before **Now**



Planting date:	Jun 25th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	30 plants
Survival%:	30 plants. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	33 cm
→ July 15th 2013	123 cm
Stem diameter:	4 cm
Crown diameter:	48 cm
Removing the Waterboxx:	July 3, 2013

ALMOND (*Prunus amigdalus*)

Before



Now



Planting date:	May 22th 2012
Monitoring Date:	30 julio del 2013
Number of plantings:	5 plants
Survival%:	5 plants 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	30 cm
→ Current date:	76 cm
Stem diameter:	10 cm
Crown diameter:	128 cm
Removing waterboxx:	July 3, 2013

MANGO (*Mangifera indica*)

Before



Now



Planting date:	March 14th 2012
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	31 cm
→ July 15th 2013:	120 cm
Stem diameter:	3 cm
Crown diameter:	60 cm
Removing waterboxx:	January 15th 2013

ORANGE (*Citrus sinensis*)

Before



Now



Planting date:	March 14th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	26 plants
Survival%:	26 plants. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	
→ July 15th 2013	207 cm
Stem diameter:	9 cm
Crown diameter:	83 cm
Waterboxx retirement date:	January 15th 2013

LEMON (*Citrus lemon*)

Before



Now



Planting date:	March 29th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	49 plants
Survival%:	49 plants. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	32 cm
→ July 15th 2013	225 cm
Stem diameter:	13 cm
Crown diameter:	160 cm
Removing the Waterboxx:	January 13, 2013

SOURSOP (*Annona muricata*)

Before

Now



Planting date:	March 14th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	14 plants
Survival%:	14 plants. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	33 cm
→ July 15th 2013	280 cm
Stem diameter:	14 cm
Crown diameter:	132 cm
Removing the Waterboxx:	January 15th 2013

STAR APPLE (*Chrysophyllum cainito*)

Before



After



Planting date:	March 14th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	20 plants
Survival%:	18 live plants (2 dead). 90%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	35 cm
→ Current date:	85 cm
Stem diameter:	4 cm
Crown diameter:	55 cm

GRAPEFRUIT (*citrus paradisi*)

Before



Now



Planting date:	March 14th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	40 plants
Survival%:	38 live plants (2 dead). 95%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	30 cm
→ Current date:	75 cm
Stem diameter:	4 cm
Crown diameter:	50 cm

5. TIMBER TREE PLANTING

YELLOW (*Tabebuia achracea*)

Before



Now



Planting date:	Jun 14th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	5 Trees
Survival%:	5 Trees. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	35 cm
→ July 15th 2013	140 cm
Stem diameter:	9 cm
Crown diameter:	120 cm
Waterboxx retirement date:	March 22th 2013

GUAIAAC (*Tabebuia chrysantha*)

Before



Now



Planting date:	Jun 14th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	5 Trees
Survival%:	5 Trees. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	36 cm
→ July 15th 2013	120 cm
Stem diameter:	9 cm
Crown diameter:	80 cm
Waterboxx retirement date:	March 22th 2013

SAMAN (*Samanea saman*)

Before

Now



Planting date:	Jun 14th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	3 trees
Survival%:	2 trees (1 dead). 67%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	35 cm
→ July 15th 2013	258 cm
Stem diameter:	14 cm
Crown diameter:	134 cm
Waterboxx retirement date:	March 22 2013

MAHOGANY (*Swietenia candollei*)

Before



Now



Planting date:	Jun 19th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	5 Trees
Survival%:	5 Trees. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	35 cm
→ July 15th 2013	228 cm
Stem diameter:	13 cm
Crown diameter:	162 cm
Removing the Waterboxx:	March 22th 2013

MELINA (*Gmelina arborea*)

Before



Now



Planting date:	Jun 20th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	22 trees
Survival%:	22 trees. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	33 cm
→ July 15th 2013	360 cm
Stem diameter:	20 cm
Crown diameter:	140 cm
Removing the Waterboxx:	December 21th 2012

LIGNUM VITAE (*Bursera Graveolens*)

Before

Now



Planting date:	Jun 22th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	5 Trees
Survival%:	3 trees (2 dead). 60%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	27 cm
→ July 15th 2013	190 cm
Stem diameter:	9 cm
Crown diameter:	148 cm
Removing the Waterboxx:	March 22th 2013

LAUREL (*Laurus nobilis*)

Before



Now



Planting date:	Jun 22th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	5 Trees
Survival%:	5 Trees. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	28 cm
→ July 15th 2013	95 cm
Stem diameter:	5 cm
Crown diameter:	65 cm

EBONY (*Diospyros ebenum*)

Before

Now



Planting date:	Jun 22th 2012
Monitoring Date:	July 30, 2013
Number of plantings:	5 Trees
Survival%:	5 Trees. 100%
Based Fertilization:	Complete Fertilizer (10 – 30 - 10)
Plant height:	
→ Before transplantation	29 cm
→ July 15th 2013	270 cm
Stem diameter:	10 cm
Crown diameter:	145 cm
Removing the Waterboxx:	March 22th 2013

6. GRAPES (*Vitis vinifera*)

The grape is a climbing wooden shrub, perennial. It has a well-developed root system and grows very fast. It grows in tropical and sub-tropical areas, with temperatures fluctuating between 2°C to 35°C, relative humidity ranges from 40-80 %, developing successfully in clay and loam soils.

GRAPE (*Vitis vinifera*)



Planting date:	Jun 28th 2012
Based Fertilization:	Complete Fertilizer (N10 –P30–K10)
Plant height:	
Before transplantation	35 cm (stolons)
July 15th 2013	1,50 cm (height trellis), abundant foliage.
Stem diameter:	7 cm
Removal Waterboxx:	The entire crop cycle.



7. FAQ

- **What is the meaning of the terminology '10-30-10' we see in every section details of timber and fruit?**

A: This terminology means that in the basis of fertilization in each timber and fruit tree in our 'Agua Vida Naturaleza' Project, was used 10% Nitrogen (N), 30% Phosphorous (P) and 10% Potassium (K).

- **What is the quantity of 'NPK 10-30-10' that has been added per tree?**

A: These percentages are derived from previously conducted soil analysis in order to know how much fertilizer we have to apply in order to prevent mineral shortages. In this case we have applied 15 grams of fertilizer per plant.

- **What is the best method to fertilize?**

A: The recommendation to use fertilizer, is to do it with drench method (fertilizer diluted and applied directly into the planting hole). Later on you can also use foliage fertilizer. The planting hole is made approximately 30 cm deep instead of 15 cm. Then we make a mix of compost and soil until the depth is 15 cm. Then we add the 20 liters of water together with fertilizers (on sandy soil) or 40 liters of water with fertilizers (on clay and loam soil) one day before planting.

- **While using the Groasis Technology with small saplings, will the use of fertilizers burn the roots?**

A: No, the roots will not bur. Fertilization takes place at least one day before planting. The minerals will be bound to the compost and the quantity is low.

- **Can you put fertilizer in the Waterboxx?**

A: No, you cannot put fertilizer in the Waterboxx. Fertilizers are likely to crystallize and therefore, this will cause the wick to clog the water distribution.

- **Can you put mycorrhizae with fertilizer?**

A: Yes, you can mix mycorrhizae in the soil below the Waterboxx. Then there is a symbiosis where mycorrhizae will help the plants to better absorb fertilizers.

- **Have you changed somewhat the planting method of the Groasis Technology in the ' Agua Vida Naturaleza' Project?**

A: Absolutely not, the Groasis Technology was implemented step by step in the procedure for planting timber and fruit trees in ' Agua Vida Naturaleza' Project.



8. RESULTS

We have planted fruit and timber trees with Groasis Waterboxx Technology. The used time of boxes for each plant is around 9 months, water is supplied by a wick.

The climate in Santa Elena Province is tropical-dry, with an annual rainfall of 211,6mm (2012).

Adaptability, growth and development of each specie was average at 97% survival. Considering that the Melina (timber tree) was transplanted with a height of 33 cm, within a year it measures currently 3,60 m. This specie grows normally in tropical-wet areas, with an annual rainfall of 1000 mm.

We also emphasize the growth rate of Lignum Vitae (*Bursera graveolens*); at the time of planting it was 27 cm. In 13 months, it measures 1,90 m with a monthly growth of 12 cm. The local population emphasize that this specie is native, so they could restore some destroyed or devastated areas.

9. CONCLUSIONS

It has been proven that the Rio Verde climate is suitable for the survival of trees and vegetables that have been planted with the Groasis Technology (innovative irrigation).

The result is reflected in the growth rate of the trees mentioned above.

In the Melina's case, the Waterboxx was taken off after 6 months, because it was a fast growth of stem that doesn't allow to take the box off if you wait longer. The Lignum Vitae was taken off after 9 months.

The intensity of the sun in Ecuador is one of the highest in the world during 'winter season'. Until now it has been impossible to plant trees without drip irrigation in this region. But these results using Groasis Technology achieved successful planting with only 40 liters of water per plant. Drip irrigation uses about 15 lt/day, this means that the use in the first year saves 99% of water. After one year, Groasis Technology doesn't use additional water. Under this concept, saving water compared to the traditional system is 100%.

The Groasis Technology is a way to plant trees and bushes in a sustainable manner.



Rio Verde, July 16th 2013

CPA. Ana Fernanda Terranova
NATIONAL DIRECTOR

Ing. Agrop. Monica Figueroa
TECHNICAL DIRECTOR

