





ZERO HUNGER BY 2030

groastis®

WFP Programa Mundial de Alimentos

INQUIRING SYSTEMS INC

ALCALDIA ALMAGUER 2016-2019 "Gobernemos Juntos"

Table of Contents

- 1. Personal opinion of strategic partners and key elements involved in the development of the Project 1**
- 2. Sustainable Land Restoration with the Groasis Ecological Water Saving Technology – ‘Zero Hunger by 2030’ Project 11**
 - 2.1 Program Objective 11
 - 2.2 Introduction 12
 - 2.3 SDG Sustainable Development Goals 14
 - 2.3.1 Poverty in Cauca 17
 - 2.3.2 Food Security in Colombian Cauca 17
 - 2.3.3 Gender Equality 17
 - 2.3.4 Water 18
 - 2.3.5 Climate change and its consequences in Colombian Cauca 19
 - 2.3.6 Biodiversity 19
 - 2.3.7 Community in the territory 20
 - 2.4.1 Performance Indicators KPI - Pilot Phase - Information to June 2018 22
 - 2.4.2 Pilot Conclusions 24
 - 2.5 Phase 1: Monitoring and Results obtained with the Groasis Waterboxx® (2018) 26
 - 2.5.1 Beneficiary Testimonials - Phase 1 28
 - 2.5.2 Performance Indicators KPI – Phase 1 - Information to December 2018 31
 - 2.5.3 Conclusions of Phase 1 36
 - 2.6 Phase 2: Implementation of the Groasis Growboxx® (January-June 2019) 38
 - 2.6.1 Results of Phase 2 40
 - 2.7 Phase 3: Economic Model with the Reuse of Groasis Waterboxx® (July-December 2019) 48
 - 2.7.1 Results of Phase 3 50
 - 2.7.2 Performance Indicators KPI – Phase 3 - Information to December 2019 56
 - 2.7.3 Conclusions of Phase 3 60
 - 2.8 Acknowledgement 62

1. Personal opinion of strategic partners and key elements involved in the development of the Project

PIETER HOFF
GROASIS



I have started in 2003 to create solutions to help plant productive trees in combination with vegetables, without using irrigation. The Groasis Ecological Water Saving Technology is easy to adapt by all agricultural families, each gender, literate or illiterate. We have learned that the technology fits perfectly in the old traditions of all cultures. That helps the acceptance fantastically and therefore you see the excellent results and high cooperation of the local communities in Colombia. We thank all our partners for their confidence in our products and will help create other projects worldwide in order to reach the UN World Food Programme's objective of 'Zero hunger by 2030'.

WOUT HOFF
GROASIS

During visits to countries on all continents, I have seen the devastating impact of land degradation such as reduced biodiversity, reduced productivity, and increased poverty. Every year millions of hectares of land are degrading, and water scarcity is an issue that affects more and more people. These facts, combined with the fact that I have two young children of my own, provide my inspiration to support Groasis.

Since 2003, Groasis has spent more than a decade to perfect the Groasis Ecological Water Saving Technology; allowing people around the globe to restore degraded land in an affordable, simple, and scalable way.

We needed a partner to reach the millions of people living in poverty and suffering from hunger – and the UN World Food Programme (WFP) seemed the partner of choice given its presence in more than 80 countries, reaching more than 80 million people.

I am very pleased that I was invited to represent Groasis at the WFP Innovation Accelerator in Munich, Germany, in 2017; showing how Groasis can Renew Soil, Restore Land, and Reshape the World through its unique Triple Ninety Benefits versus traditional planting methods: 90% lower cost, 90% less water, and 90% survival rate.

I am even more pleased that Groasis is part of the first cohort of companies to receive support from the WFP Innovation Accelerator, and that we have managed to implement such a positive project in Colombia.

I am looking forward to replicating this success at a larger scale, and in many more of WFP's countries. WFP and Groasis can change the lives of millions of WFP's beneficiaries by creating sustainable food production systems that allow them to grow their own food and generate an income.



**PAMELA CAMPBELL, CEO – CLAUDIA MEGLIN, PROJECT MANAGER
INQUIRING SYSTEMS INC**

Over the past year and a half, we had the honor to work with Ana Terranova as a local project manager on our Great Green Way project in Colombia. The Mental Insight Foundation- funded project is executed in collaboration with The World Food Bank.

The goal of this project is to create sustainable, resilient food production systems that benefit the smallholder farmer and the local communities utilizing the Groasis Technology (currently a combination of Growboxxes® and Waterboxxes®). An additional aim of the project is to sustainably restore degraded land in Colombia through a combination of ecologically and economically valuable trees and vegetables for food production.

In the 1st phase of our collaboration, each of the beneficiaries received Groasis Waterboxx®, fruit tree seedlings, fertilizer, and the necessary training to optimize the use of the Groasis Waterboxxes®, including step-by-step training of the planting process, along with the benefits of the Groasis Waterboxx and project objectives.

As a Groasis technician in the field, Ana visited each of the participating villages multiple times, where she trained, recorded and evaluated variables and measured parameters. Ana gave advice and recommendations in the cases where Mother Nature brought her own challenges. Challenges including: pests, diseases, short periods of rain that caused floods and mudslides, long periods of drought with an imposing and inclement sun, and difficulties vacating the drug crops of the past, along with other socio-cultural impacts of the introduction of the Groasis Technology in these rural areas.

Where conditions permitted, the results of the Waterboxx®, planting yielded great success – within one year of planting. Some of the trees are ready producing fruits. We do believe that Ana’s unbreakable trust in this project and her excellent due diligence played a significant role in the success of this project.

In the 2nd phase, the project has shifted to the participating women purchasing seedlings with their own funds from the Association of Rural Women Almaguereñas AMURA. The growers were able to reuse The Groasis Waterboxx® and continue to be monitored by Ana. We are pleased with this outcome as we see it is a critical step for the rural communities to reclaim their power and autonomy.

Impact: In working with the UN WFP, we have been able to increase our impact and the realization of integrated social, economic, and environmental value. This has been accomplished through increasing knowledge and education around alternative farming methodologies in rural Colombia. We are working to expand this prototype into other critical areas across the globe.

Looking forward: The Waterboxxes® are designed to be reused for up to 10 years. In the future, we envision a Circular Economy model designed around the Waterboxxes®. Following years of use and reuse, the Waterboxxes® that can no longer be used will be re-collected and recycled for the production of new Waterboxxes®.

In conclusion: This is an amazing project and we thank the team of Groasis, Ana Terranova, Association of Rural Women Almaguereñas AMURA and the World Food Bank for their support.

MARIO PUENTES
Senior Field Monitor - UNITED NATIONS WORLD FOOD PROGRAMME-Pasto Sub Office in
COLOMBIA



The “Zero Hunger by 2030” Project is an example of how with appropriate tools to the context, a disciplined and committed group and the accompaniment and permanent technical assistance in the field can achieve the proposed objectives. A well-deserved recognition to all women entrepreneurs who with perseverance and dedication they continue to fight for their families and their association, to the municipal government entities that joined the cause and who decidedly trusted and supported the process from the beginning, to the Amura Association for contributing to the development of the municipality and increasingly empower women and men who are united by equity and equality, and Groasis that more than technology provided human and professional quality during all processes and permanent technical support in the territory.

LAURA ANACONA

Leader and Legal Representative of the Association of Rural Women Almaguereñas AMURA

The Project has been a great help for our Association of Rural Women Almaguereñas AMURA. The Groasis Waterboxx® works excellently, in times of drought. Saplings planted in the Waterboxx® did not die and grew fast.



As leader of AMURA, I want to express our immense gratitude to all who were part of this team. Especially, to Jeyson Castaño, for all the support provided.

We hope that our experience meets the expectations of the sponsors, and we will be attentive and available for future projects.

DIEGO BRAVO ROMERO

Representative of the Secretariat of Agriculture - Municipio de Almaguer



As a participant in the development of such a significant project, I must note that, this has been of relevant importance in the technological development applicable in desert areas or that due to its topography and climatic phenomena they lack the precious liquid such as water, the main element in agricultural practices

The application of the Waterboxx® use system in our territories has produced remarkable results thus facilitating the management of crops, as well as the achievement in increasing production in the different established crops, mainly in the area of fruit trees. As a main topic, I suggest on a personal basis and on behalf of our communities the continuity of this series of projects with the mitigating that must be accompanied by the tools and supplies required until the first harvest is achieved, specifically as elements for tutored, as well as punctual technical assistance to accompany the beneficiaries in their agricultural practice. I still have to reiterate our gratitude for this great contribution in favour of the development of our field and in the improvement of the quality of life of our communities.

ANA FERNANDA TERRANOVA
Project Manager GROASIS

Since 2012, I have visited multiple villas and rural communities in different areas of Ecuador. The years pass, and the socio-economic reality of the peasant and the agricultural sector has not changed, it is a common factor: the lack of opportunities, the lack of interest of the state entities in turn in the agriculture, shortage of economic resources, the migration towards large cities for the search for sources of income and job stability, marriages or unions in fact almost childish as well as the pregnancies of young women who for not having money with their parents prefer to commit "with someone" to at least have to eat. Very apart from climate change, which affects all our ecosystems and habitats.

The situation has not changed nor has it been different when visiting the Colombian countryside, rather it could be darkened even more if I focus on the victims of subversive violence, the massive displacement of rural families out of fear, the still presence of illicit crops.

Despite all these factors, the Almaguereños are friendly, hospitable, and very honest people. This document writes our technical experience and the optimal results with Groasis Waterboxx® and Growboxx® Technology.

But, I would also like to emphasize that these productive projects are nothing without the human element that carries out daily activities, the care of crops: women farmers in the Municipality of Almaguer.

The "Sustainable of the land Restoration with the Groasis Ecological Water Saving Technology" Project has allowed women as a whole to obtain economic returns that benefit not only the families of the villages (veredas), but also "open their eyes" and realize that business opportunities can be created with Groasis Technology .

This group of women are "echadas pa'lante" (determined with initiative to move forward), and have not missed the support given, to show that they can work and earn money sustainably.

The search for new markets to market your products is an "Achilles heel" for the development of your potential sales.

I am very grateful to all the leaders who welcomed me in their homes, to the authorities of the Municipality who provided us with the tools that were available to them for the project, to the families from Almaguereñas who never treated me like an outsider.

What started as a 6 month pilot became an unforgettable experience of almost 2 years. Someday, I vehemently wish to hear that the Cauca Sur Colombiano is a pioneer in the export of fruits and vegetables, guided by a group of women. I have placed a seed, to this dream!



JEYSON MUÑOZ CASTAÑO
Ingeniero - Técnico de campo GROASIS



When the project started with the support of the World Food Programme and Groasis, I was able to immediately demonstrate its main objective: to cultivate in degraded soils and with little water availability.

As we know in Colombia, we are rich in our landscapes and huge tributaries, however in areas such as the Macizo Colombiano where large rivers are born, there is a shortage of the vital liquid. Therefore, working with the community of the Municipality of Almaguer has been satisfactory, demonstrating to the population the alternatives that exist to cultivate during periods of drought.

When the implementation of Groasis Waterboxx® and Growboxx® Technology was started, accompanied by technical assistance and training on how Groasis Technology worked, one could observe the admiration of the working groups on a new, economic and fundamental system for the Colombian countryside

In periods of drought (approximately 8 months) with Groasis Technology we have no concern, since the results in each of the working groups are significant; grow vegetables in variety and quantity if possible in summer time and as if that were not enough, while we cultivate short-cycle species in the same space, we can grow fruit or forest trees and thus strengthen polyculture production systems.

This experience has been very rewarding when working with communities affected by armed groups, with water scarcity and low economic income. The Groasis Technology allows you to grow fruits and vegetables, with low cost without the need to have large capital, compared to the implementation of irrigation systems or chemical synthesis products but rather take full advantage of the water for several months and as if that were not enough, supplies provided by the same farm to generate self-support. Therefore, as a professional, together with the social leaders of each of the working groups, we are grateful to know and apply the Groasis

Ecological Water Saving Technology for the environment and the community, demonstrating that it can be cultivated by conserving and conserved by cultivating.



2. Sustainable Land Restoration with the Groasis Ecological Water Saving Technology – ‘Zero Hunger by 2030’ Project

The Project “ Sustainable Land Restoration with the Groasis Ecological Water Saving Technology - Zero Hunger by 2030 ” started as a Sprint Application of the Innovation Accelerator of the United Nations World Food Programme, from its home in Munich -Germany through initial financial support (Year 2017) together with the Dutch company Groasis BV.

The UN estimates that 2 billion hectares of the world's land area (15%) suffer from soil degradation, so it is not suitable for forestry or agriculture, with another extra 12 million hectares of arable land (an area equivalent to half of the United Kingdom) every year due to drought, desertification and overexploitation. The problem of land degradation will only get worse over time as demographic pressures increase the need for food, water and sanitation.

2.1 Program Objective

The objective of the Sprint pilot program is to provide community members, small local farmers and families (UN WFP beneficiaries) with a combination of Growboxxes® and Waterboxxes® to determine the impact that can be achieved with Groasis Technology on: land restoration, agro-forestry and food production, increasing biodiversity and green cover on hectares of degraded land that are replanted with Waterboxxes® and Growboxxes®. The UN World Food Programme - Colombia has identified land degradation as a programmatic challenge, and seeks to sustainably restore degraded land in Colombia – and if successful also elsewhere - with a combination of trees, while producing food sources for its beneficiaries.

2.2 Introduction

The role of the UN World Food Programme (UN WFP) is to end world hunger. UN WFP provides first-line emergency assistance and works with governments, United Nations agencies, non-governmental organizations, businesses and individuals to address the underlying causes of hunger, strengthen self-reliance and improve food security. UN WFP works to achieve a world with Zero Hunger, as defined in the Sustainable Development Goals (SDGs) signed by governments around the world in September 2015.

The UN WFP Innovation Accelerator identifies, nurtures and scales bold solutions to fight hunger worldwide. In 2017 it has identified Groasis as [one of its Innovation Accelerators](#).

The UN World Food Program (WFP) is inspiring and supporting new ideas, tools and solutions that ensure that no one goes hungry.

The Innovation Accelerator project believes that the way forward in the fight against hunger is not necessarily in the construction of big plans, but in the identification and testing of solutions in an agile way. It is a space in which the world can discover what works and what does not in the combat to end hunger, a place where we can be bold and succeed.

The Municipality of Almaguer is located in the department of Cauca, southeast of its capital Popayán and distant from it 172 km away.

Almaguer suffered an era of violence, assassinations and guerrilla takings because of subversive groups.

However, its people are strong conformed by indigenous reservations and rural population who work as a team the land, as sustenance of their families, this being the first step of the development of the region's economy.

The Project “Zero Hunger by 2030”, is developed in the Municipality of Almaguer.

The beneficiaries-participants of the project are women members of the Association of Rural Women Almaguereñas AMURA.

AMURA is an organization that brings together 600 indigenous and rural women from the area who are looking for ways to contribute financially to their surroundings.

AMURA are part of the strategy implemented by UN Women with various agencies of the System of Nations in Colombia (UN WFP, UNDP and FAO) as well as national government entities and whose purpose is to move towards the achievement of the Sustainable Development Goals (SDGs) as structural elements of peace building at territorial level.

Groasis Ecological Water Saving Technology offers Growboxx® and Waterboxx® as a direct response to the challenge of deforestation and devastation of eroded lands. Groasis is successfully present in 43 countries around the world.

Waterboxx® is the ideal and sustainable alternative for extensive and sustainable land restoration. Made of polypropylene (plastic), it can be reused 10-15 times.

Its characteristics make it extremely profitable, leaving drip irrigation aside.

Growboxx® represents a transformative advance for planting in degraded lands.

It is an intelligent bucket of biodegradable paper pulp, with a capacity of five plants per box. Its benefits make it an incredibly cheap, liberating and sustainable method.

Groasis Technology uses 90% less water than conventional irrigation, at a zero cost of energy, reduces the cost of planting and cultivating degraded land by 90% and has a plant survival rate of +90%.

With the implementation of the 'Zero Hunger by 2030' Project, the training and coaching of the Groasis Waterboxx® and Growboxx® Technology allows to guide the beneficiary women to improve agricultural practices, maintaining a stable agriculture throughout the year (facing the problem of scarcity of water in the area and prolonged months without rains) with a minimum consumption of water (90% savings of the vital liquid), diversify their crops, increase biodiversity and forest cover, improving the productive capacity of soils devastated by climate change, reuse rainwater, abandon illegal crops, achieve food security, end hunger, improve nutrition and promote sustainable agriculture. On the other hand, we reduce inequality between men and women, through the inclusive economic growth of women, generating income from the commercialization of crops.

The 'Zero Hunger by 2030' Project, is a win-win for all members, as it is a program aimed at the development of an intelligent, sustainable agriculture, with an innovative technology that guarantees the saving of water resources in agricultural activities, obtaining an agricultural production necessary for food security, and the monetary exchange that helps the subsistence of the participating families.



Charlie Gómez and Byron Medina (7) from Alttillo with Tree Tomate of 90cm and 3 different vegetables, planted in 20190219 with Groasis Growboxx®. Monitoring Phase 2. Photo taken: 20190618 (4 months later).

2.3 SDG Sustainable Development Goals

In 2015, the United Nations Organization UN approved the 2030 Agenda on Sustainable Development, an action plan to be followed in favor of humanity and the planet.

The Agenda has 17 Sustainable Development Goals, integrated and indivisible, global in scope and universally applied, linking sustainable development and other relevant processes, formulated for the elimination of poverty, the fight against climate change, education, women's equality, the defense of the environment and the design of our cities.



SUSTAINABLE DEVELOPMENT GOALS



The Sustainable Development Goals are:

1. No Poverty.
Ending poverty in all its forms, worldwide, with inclusive economic growth, creating sustainable and equal jobs.
2. Zero Hunger.
Ending hunger, achieving food security with improved nutrition and sustainable agriculture.
3. Good Health and Well Being.
Ensure a healthy life and promote well-being for all at all ages.
4. Quality Education.
Education is the basis for better quality of life. An inclusive, equitable education that guarantees opportunities.
5. Gender Equality.
Achieving gender equality and empowerment of all women and girls. Gender equality is not only a fundamental human right, but the necessary basis for a peaceful, prosperous and sustainable world.
6. Clean Water and Sanitation.

Ensure access and availability of clean water, free of impurities and sustainable management.

7. Affordable and Clean Energy.

Ensure access to affordable, safe, sustainable and modern energy for all.

8. Decent Work and Economic Growth.

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

9. Industry, Innovation and Infrastructure.

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

10. Reduces Inequalities.

Application of universal policies that pay special attention to the needs of disadvantaged and marginalized populations.

11. Sustainable cities and communities.

Make cities and human settlements inclusive, safe, resilient and sustainable.

12. Responsible Consumption and Production.

Do more with and better things with less resources: create sustainable consumption and production.

13. Climate Action.

Scope of viable solutions to enable countries to have a more sustainable and greener economic activity to the environment.

14. Life Below Water.

Marine protected areas must be managed effectively, have sufficient resources and regulations for sustainable development.

15. Life On Land.

Sustainably manage forests and terrestrial ecosystems, combat desertification, stop and reverse land degradation and halt the loss of biodiversity

16. Peace, Justice and Strong Institutions.

Universal access to justice and the construction of responsible and effective and inclusive institutions at all levels, for sustainable development.

17. Partnerships For The Goals.

Strengthen the means of execution and revitalize the global alliance for sustainable development.

The Groasis Ecological Water Saving Technology will help reach 9 of the 17 goals: 1, 2, 3, 5, 6, 8, 10, 13 and 15.

2.3.1 Poverty in Cauca

Eradicating poverty in all its forms remains one of the main challenges facing humanity. Poverty reflects the denial of people's fundamental opportunities and an affectation of their human development because they cannot expand their welfare options. From the perspective of human development, the progress of all members of a community, but especially the poor. The conception of poverty measured by income and hunger associated with malnutrition; it is assumed that insufficient income to meet basic needs also creates a lack of social and political opportunities and options.

Factors that cause poverty in the area: progressive loss of land, the breakdown of community economies and limited opportunities for rural work, which force them to migrate in search of informal jobs, such as: informal sales, domestic service and occasional activities , which generate little income and lack social protection. To the above is added, in the near past, the presence of illegal armed groups in their territories, which have forced them to leave them and join urban marginal areas, deteriorating the social fabric of their communities and breaking their ancestral cultural ties.

2.3.2 Food Security in Colombian Cauca

The food and nutritional insecurity of Cauca has a direct correlation with the absence of employment.

In the rural area the incidence of the problem is critical, since although there are resources such as land, water and labor, there is a higher Index of Unsatisfied Basic Needs (NBI) that adds to the difficulty of producing enough food for region, in such a way that it meets the minimum food needs of caucanos.

Nowadays, despite the fact that the agricultural sector is one of the lines that contributes 10% of the total GDP (Gross Domestic Product) and employs approximately 46.1% of those employed, there is not enough food for their own population in the area and it depends on products from nearby departments.

The soils, in addition to being over-exploited, are low fertility soils for agricultural production, which makes agriculture more expensive, causing a crisis in the rural economy due to the high cost of supplies, the precarious state of the access roads and high rates of rural poverty.

Intensive exploitation, lack of proper practices, agrochemicals, fertilizers, and illicit crops have an impact on food security and food sovereignty in the area.

2.3.3 Gender Equality

The possibility of women living in poverty is disproportionately high in relation to men, due to unequal access to paid work, education and property.

Economic empowerment in terms of equity and participation is what can most rapidly make the economy grow in the area.

We are living in a time of economic slowdown that affects the most vulnerable sectors, where there is nothing more powerful to boost and accelerate the economy than equity.

Expanding the picture, in Latin America, one in four women married before age 18, a situation that has detrimental effects such as dropping out of studies and exposure to violence by the couple.

If this trend continues, for the next ten years, the region will have one of the world's child marriage rates, just behind Sub-Saharan Africa.

In turn, the obstacles faced by rural women must be recognized so that their productive role in family farming, mostly unpaid and informal, is recognized and formalized. These conditions added to the lack of social recognition of women as producers - especially at the local level - as owners and as decision makers are limitations and stigmas that persist to the detriment of their socioeconomic and legal empowerment.

2.3.4 Water

The Macizo Colombian is the most important nucleus at the national level of the high hydrographic zones of the Cauca, Patía, Magdalena and Caquetá rivers.

However, despite the large number of tributaries in Cauca, climate change adds to a challenge that already exists in the area around the availability of water resources.

The supply of the water resource is today one of the most critical aspects of climate change, both for human supply and for productive development.

If it is taken into account that more than 50% of Cauca has lost or transformed its vegetation cover and this trend continues to increase, future scenarios are worrisome as regards the fragility of the water system. This situation is alarming for economic development, since agricultural sectors depend on water availability. Long periods of drought, as a climatic event, violate farmers and the general population.

The tendency to suffer limitations due to water availability is high and there is a fragility in the water system.

The number of months and areas with a tendency to rain below normal, are elements that add significantly to the sensitivity of the territory. The municipality has been experiencing drought and desertification problems.

We could summarize that the water resource is one of the most critical, threatened and vulnerable aspects in the area, both for human use and for agricultural development.

2.3.5 Climate change and its consequences in Colombian Cauca

The main cause of global warming, which in turn causes climate change, is the increase in the atmospheric concentration of Greenhouse Gases (GHG).

They are produced in greater proportion due to anthropogenic activities, such as the production of goods and services; resource extraction and exploitation; as well as population settlement and consumption habits.

The consequences of this change are experienced in specific manifestations such as the increase in the magnitude and frequency of extreme weather events: gales, torrential rains, periods of drought, hurricanes, among others; These events entail other consequences that affect the quality of life of the populations, such as the reduction in food availability, road and infrastructure impacts, changes in ecosystems and a decrease in the quantity and quality of water resources.

Colombia is within the group of 40 countries with the greatest historical participation in the production of GHG, mainly due to the deforestation evidenced in the national territory.

Currently, the impact of the climate on agricultural activities is high and causes a variety of problems such as the increase in the incidence of pests and diseases, stress due to drought, decreased productivity, production displacement and soil degradation and natural resources.

2.3.6 Biodiversity

In the eighties of the twentieth century, the term “sustainable development” was coined emphasizing that the social, economic and environmental spheres could not be separated.

In general, one cannot lose sight of the fact that there is a narrow overlap between the socioeconomic and environmental dimensions.

Inequality, poverty, the precariousness of the economic base are closely related to environmental degradation caused by unsustainable development models.

The great pressure and processes of appropriation of vegetation cover for activities of transformation and adaptation of land for agriculture, livestock, illicit crops and mining extraction, has generated in recent years an accelerated degradation, accentuating the processes of fragmentation of ecosystems and resources plants, promoting erosive processes and affecting the environmental offer of the habitat, which jeopardizes the sustainability of these areas.

Bulletins on the deforestation of IDEAM in 2015 show reductions in forest cover that not only impact biodiversity but also GHG emission levels in the Department.

Climate change can affect areas suitable for forestry activities that are of the utmost importance, given that the natural capital of the area depends on the large areas of natural and planted forests that support the provision of ecosystem services such as water regulation, security food and habitat for species.

Given its close relationship and dependence on the environment and its natural resources, this area faces direct consequences of climate change.

2.3.7 Community in the territory

The community has an indigenous and rural population, but also a population of Afro-Colombians.

For the indigenous communities, the cultivation of the land is carried out with a community base and is the subsistence support, being the tulle or family garden the primary source of their food and health, and the way to get the items that they cannot buy.

Among the most important agricultural activities for these communities are the cultivation of coffee, cane, plantain, corn, beans and peanuts.

However, among their concerns are the scarcity of land, the deterioration of the soils, the protection of the forests, the moors and the water sources that they keep as a priority. Indigenous communities are vulnerable to climate change because their livelihood is closely linked to the territory and the scenarios of this event, which threaten, among others, food sovereignty and security and the provision of water.

On the other hand, the peasant communities, in addition to sharing the situation of vulnerability due to the effects of climate change in terms of the increase in temperature and the decrease in rainfall, must face the situation of scarcity of the areas suitable for developing the activity and lack of soil fertility. In addition, there is a lack of infrastructure such as paved roads in areas of agricultural vocation.

This situation especially affects the food security of caucanos and especially peasant communities both in their role as producers and that of consumers.



Hato Viejo Group on the day of implementation and planting with the Groasis Waterboxx® with Mora Castilla. Piloto Phase. Photo taken 20180227.

2.4 Pilot: Preliminary Results: January – June 2018

The coordination and the joint work of the strategic partners, have allowed a successful development of the activities of the Pilot "Sustainable restoration of the land with the Groasis Ecological Water Saving Technology - 'Zero Hunger by 2030' Project and have been the key piece for the achievement of subsequent phases.

The pilot project was carried out with the award-winning Groasis Waterboxx® for planting different species of fruit trees.

In February 2018, the pilot's socialization and exposure to the women beneficiaries of the AMURA Association, the identification of the areas most affected by water scarcity and climate change, the fruit species that would be cultivated, as well as the need for commitment, responsibility and teamwork allowed us to determine the paths with which the pilot was implemented.

For this pilot phase, we had:

- **13 participating veredas:** Pitayas, Herradura, Ruiz, Yunga, Altillo, Yacuanas, Elvecia, Gonzalo, Palizada, Tarabita 1, Tarabita 2, Hato Viejo, Gabrielas.
- **197 women directly involved in the Project.**
- **985 seedlings of fruits trees delivered:** Lemon Tahiti (*Citrus latifolia*), Avocado Lorraine (*Persea americana*), Passion Fruit (*Passiflora edulis*), Blackberry Castilla (*Rubus glaucus*), Papaya Tahinu (*Carica papaya*).
- **985 Groasis Waterboxx® used.**




During the 6 months of the pilot, the results of the data record and evaluation methods complied with 100% of the optimization of the Groasis Waterboxx® and of the measured agronomic variables, such as:

Tree height, water consumption, crop adaptability, difference with the control group.

The preliminary results obtained during the pilot exceeded our expectations, as the indicators below will show.

*In the case of Hato Viejo ** and Gabrielas **, the vegetative material chosen (Mora Castilla) presented Botrytis (fungus) and the edafoclimatic characteristics of both areas negatively affected the seedlings during planting, affecting their survival and growth.*

2.4.1 Performance Indicators KPI - Pilot Phase - Information to June 2018

KPI (Performance Indicators)	
	Reach or exceed the objective fulfillment
	Below target
	Significantly less than the objective

Name of veredas	# direct beneficiaries in the pilot	# Waterboxx given (5 WB per beneficiary)	# trees planted in February 2018	# No surviving trees to June 2018	Total surviving trees
ALTILLO	12	60	60	2	58
ELVECIA	13	65	65	0	65
GABRIELA	16	80	80	9	71
GONZALO	13	65	65	0	65
HATO VIEJO	21	105	105	24	81
HERRADURA	10	50	50	0	50
PALIZADA	18	90	90	0	90
PITAYAS	21	105	105	0	105
RUIZ	6	30	30	4	26
TARABITA 1	25	125	125	6	119
TARABITA 2	16	80	80	1	79
YACUANAS BAJO	10	50	50	0	50
YUNGA	16	80	80	1	79
TOTAL	197	985	985	47	938

Figure 1.- Detail of the 13 beneficiary veredas of the pilot with: number of participants, Waterboxx® and seedlings delivered, surviving trees.















Name of veredas	% survival achieved	% Minimum Objective - % survival	KPI's Survival Achieved
ALTILLO	96,67%	90%	
ELVECIA	100,00%	90%	
GABRIELA	88,75%	90%	
GONZALO	100,00%	90%	
HATO VIEJO	77,14%	90%	
HERRADURA	100,00%	90%	
PALIZADA	100,00%	90%	
PITAYAS	100,00%	90%	
RUIZ	86,67%	90%	
TARABITA 1	95,20%	90%	
TARABITA 2	98,75%	90%	
YACUANAS BAJO	100,00%	90%	
YUNGA	98,75%	90%	
TOTAL	95,23%	90%	

Figure 2.- The overall survival achieved was 95.23%, compared to 90% of the minimum target required.















Name of veredas	% mortality	% Maximum Target -		Kpi's Mortality
		% mortality	% mortality	
ALTILLO	3,33%		10%	
ELVECIA	0,00%		10%	
GABRIELA	11,25%		10%	
GONZALO	0,00%		10%	
HATO VIEJO	22,86%		10%	
HERRADURA	0,00%		10%	
PALIZADA	0,00%		10%	
PITAYAS	0,00%		10%	
RUIZ	13,33%		10%	
TARABITA 1	4,80%		10%	
TARABITA 2	1,25%		10%	
YACUANAS BAJO	0,00%		10%	
YUNGA	1,25%		10%	
TOTAL	4,77%		10%	

Figure 3.- The total mortality reached was 4.77%, compared to 10% of the required target. It should be noted that the paths of Gabrielas and Hato Viejo affect this% of mortality.















Name of veredas	IN CENTIMETERS					
	Initial height	Last height	Height	% Objective		
	February 2018	Junio 2018	difference	% Growth	Tree Growth	KPI's Growth
ALTILLO	2480	4284	1804	72,74%	25%	
ELVECIA	1158	5013,5	3855,5	332,94%	25%	
GABRIELA	1561	1772,5	211,5	13,55%	25%	
GONZALO	896	11507	10611	1184,26%	25%	
HATO VIEJO	1416,4	1278,5	-137,9	-9,74%	25%	
HERRADURA	777,9	1754	976,1	125,48%	25%	
PALIZADA	1453	14748	13295	915,00%	25%	
PITAYAS	7260	9437	2177	29,99%	25%	
RUIZ	152	1282	1130	743,42%	25%	
TARABITA 1	4703	8479,5	3776,5	80,30%	25%	
TARABITA 2	4621,9	5970	1348,1	29,17%	25%	
YACUANAS BAJO	3021	3639	618	20,46%	25%	
YUNGA	3725	5772,5	2047,5	54,97%	25%	
TOTAL	33225,2	74937,5	41712,3	125,54%	25%	

Figure 4.- The overall growth achieved was 125.54%, compared to 25% of the required objective.

Name of veredas	% Water Saving February 2018	% Water Saving - last monitoring June 2018	% Water Saving Objective	KPI's Water Saving
ALTILLO	100%	100%	90%	●
ELVECIA	100%	100%	90%	●
GABRIELA	100%	100%	90%	●
GONZALO	100%	100%	90%	●
HATO VIEJO	100%	100%	90%	●
HERRADURA	100%	100%	90%	●
PALIZADA	100%	100%	90%	●
PITAYAS	100%	100%	90%	●
RUIZ	100%	100%	90%	●
TARABITA 1	100%	100%	90%	●
TARABITA 2	100%	100%	90%	●
YACUANAS BAJO	100%	100%	90%	●
YUNGA	100%	100%	90%	●
TOTAL	100%	100%	90%	●

Figure 5.- The % water savings achieved was 100% compared to 90% of the required objective.

2.4.2 Pilot Conclusions

The Pilot project “Sustainable restoration of the land with the Groasis Ecological Water Saving Technology - ‘Zero Hunger by 2030’ Project was greatly accepted by the community of Almaguer, taking a first step to build competitive, innovative and resilient productive projects, due not only 100% of the adaptability of the vegetative material with the Groasis Waterboxx® Technology, but also because of the possibility of obtaining perennial crops with less water consumption and projecting future development of the Municipality, understanding the difficult scenarios of the area.

The Performance Indicator ‘KPIs’ obtained exceeded the expected percentages.

The union of efforts and the participatory process that has been generated to develop this pilot with both public and private actors and civil society, created the basis to start a Phase 1 and begin to consolidate this plan as a replicable program.

During these six months, the project pilot has demonstrated compliance with the main objective, which is to provide members of the Association of Rural Women Almaguereñas AMURA, Groasis Waterboxx® devices to determine the impact that can be achieved for land restoration purposes, agro-forestry and food production and thus demonstrate lasting results in the form of a high survival rate of planted trees, increasing biodiversity and green cover on hectares of degraded land.



Ana Terranova and Jeyson Castaño, in the first monitoring of the Pilot Phase, Vereda Palizada. Passion fruit planted in Groasis Waterboxx® . Photo taken 20180328.



Panoramic view of lemon crops with Groasis Waterboxx® in Yacuanas vereda. Pilot Phase. Photo taken 20180327.

2.5 Phase 1: Monitoring and Results obtained with the Groasis Waterboxx® (2018)

A key element to continue with the implementation of new phases of the Project “Sustainable Land Restoration with Groasis Ecological Water Saving Technology - ‘Zero Hunger by 2030’ Project is to have possible sources of external financing for its development.

To carry out Phase 1 of the Project, we have the financial support of a new strategic partner: Inquiring Systems Inc. from Santa Rosa USA, donor administrators for the Sonoma Mental Insight Foundation.

The sum of economic efforts allows us to integrate and make it possible to reach a greater number of beneficiary families in our productive project.

The results obtained during Phase 1 with Groasis Waterboxx® Technology, show us that we can cultivate in all types of soils: virgin, degraded, with pastures, subject to burning; obtaining economic gains in the harvests and diversifying the crops with new species that guarantee the alimentary security of the families, saving vital liquid and recovering soils that were considered lost.

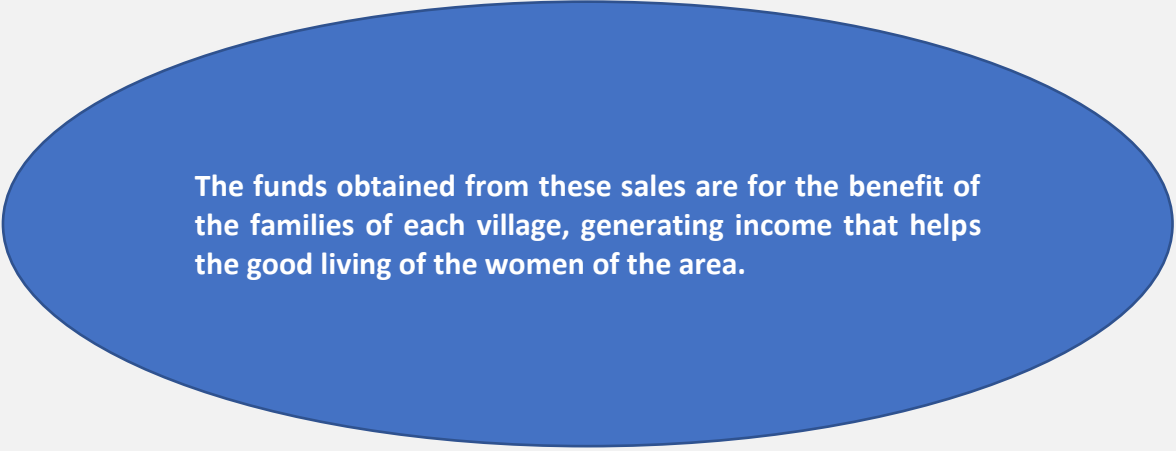
It is worth emphasizing that it is the first time that in the Municipality of Almaguer, planting of crops is carried out with an innovative system, technified and in greater volume of land. In Phase 1, we obtained important results (see KPI's Performance Indicators). The plants are vigorous with strong stems, green leaves without the presence of pests or diseases with accelerated growth.

Next, the leaders of the Palizada, Gonzalo and Elvecia Veredas grant us their personal comments about the Project.

In these veredas, the passion fruit crops with the Groasis Waterboxx® have already obtained crops, large fruits with good pulp and sweet taste. These crops were organically fertilized with guinea pig and rabbit manure.

In these veredas, they still use Waterboxx® as water sources for crop development. They did not remove them at 8-9 months, but continually supply the plants with water. Interesting!

Marketing in the peasant market is \$ 3,000COP per kilo, and new markets are being sought where to possess the fruit to improve the marketing price.



The funds obtained from these sales are for the benefit of the families of each village, generating income that helps the good living of the women of the area.

2.5.1 Beneficiary Testimonials - Phase 1

Name: Hermilda Hoyos

Vereda: Palizada

Testimony about her experience with the Groasis Waterboxx®



"I am the leader of a group of 18 women, who work very hard.

We have worked with different annual crops such as corn, cassava, peanuts.

At the moment, we are with the passion fruit cultivation thanks to the new Waterboxx® Technology.

It really is a great help because in this area it is very hot during Summer and the crops are delayed this Summer, because of the too strong sun.

*The Waterboxx® have worked wonders for us, now we have obtained a first passion fruit harvest. **We have sold approximately 420 pounds.***

This fruit has been shipped to the municipality and its sale has been very good.

We hope that in the future, the fruits will be better sold, with higher sales revenue.

In the next few days we will have a new harvest, and we expect good results.

The crop is very beautiful, as you can see and it will be sold in the market.

Although we are looking for new trading sites, over time, market at a better price.

Thank God, and you for helping us. I hope we continue with these productive projects. "

Name: Sandra Muñoz

Vereda: Gonzalo

Testimony about her experience with the Groasis Waterboxx®



“In our vereda we have only grown cane, coffee, corn, beans and peanuts, annual crops, taking advantage of the short rainy seasons. We suffer from drought in this area. With the project and Waterboxx® Technology we can plant new tree alternatives. Have perennial crops. We decided on passion fruit, papaya and avocado. Actually, we have done very well with the project, with good results, we have obtained passion fruit of good quality. ”

Name: Aurelia López

Vereda: Elvecia

Testimony about her experience with the Groasis Waterboxx®






“ With my group of women we have worked with plastic boxes, Waterboxx®, with passion fruit. In the Vereda Elvecia we suffer a lot from the lack of water, this whole sector of the municipality of Almaguer suffers from lack of water.

We are very happy, because the passion fruit cultivation has been very good. We have generated income from the sales of the fruits, improving our quality of life.

The fruit of passion fruit we get is large and with a lot of pulp, good food inside.

This area has only grown coffee and cane, but thanks to Waterboxx® Technology we start new crops. ”

2.5.2 Performance Indicators KPI – Phase 1 - Information to December 2018

KPI (Performance Indicators)	
	Reach or exceed the objective fulfillment
	Below target
	Significantly less than the objective

Name of Veredas	N° Women Directly Benefited Phase 1	N° Waterboxx given to the Project	N° Planted trees February 2018	N° Non Surviving Trees December 2018	Total Surviving trees Jan - Dec 2018
ALTILLO	12	60	60	0	60
ELVECIA	13	65	65	2	63
GABRIELAS	16	80	80	17	63
GONZALO	13	65	65	0	65
HATO VIEJO**	21	105	105	45	60
HERRADURA	10	50	50	0	50
PALIZADA	18	90	90	0	90
PITAYAS	21	105	105	2	103
RUIZ	6	30	30	5	25
TARABITA 1	25	125	125	13	112
TARABITA 2	16	80	80	3	77
YACUANAS BAJO	10	50	50	0	50
YUNGA	16	80	80	0	80
Total general	197	985	985	87	898

Figure 6.- Detail of the benefited veredas, number of participants, number of Groasis Waterboxx® and seedlings delivered, surviving trees.















Name of Veredas	% Total Survival Achieved Phase 1 - Dec 2018	% Survival Accepted Objective	KPI's Survival Achieved
ALTILLO	100,00%	90%	
ELVECIA	96,92%	90%	
GABRIELAS	78,75%	90%	
GONZALO	100,00%	90%	
HATO VIEJO**	57,14%	90%	
HERRADURA	100,00%	90%	
PALIZADA	100,00%	90%	
PITAYAS	98,10%	90%	
RUIZ	83,33%	90%	
TARABITA 1	89,60%	90%	
TARABITA 2	96,25%	90%	
YACUANAS BAJO	100,00%	90%	
YUNGA	100,00%	90%	
Total general	91,17%	90%	

Figure 7.- The overall survival achieved was 91.17%, compared to 90% of the minimum target required.















Name of Veredas	% mortality Phase 1 - Dec 2018	% Mortality Accepted Objective	KPI's Mortality
ALTILLO	0,00%	10%	
ELVECIA	3,08%	10%	
GABRIELAS	21,25%	10%	
GONZALO	0,00%	10%	
HATO VIEJO**	42,86%	10%	
HERRADURA	0,00%	10%	
PALIZADA	0,00%	10%	
PITAYAS	1,90%	10%	
RUIZ	16,67%	10%	
TARABITA 1	10,40%	10%	
TARABITA 2	3,75%	10%	
YACUANAS BAJO	0,00%	10%	
YUNGA	0,00%	10%	
Total general	8,83%	10%	

Figure 8.- The overall mortality reached was 8.83%, compared to 10% of the required target.

** It should be noted that the veredas of Gabrielas and Hato Viejo affect this% of mortality with Mora Castilla crops.















Name of Veredas	IN CENTIMETERS			% Growth Achieved Phase 1 - Dec 2018	% Accepted Growth Objective	KPI's Growth
	Initial Height Feb 2018	Final Height Dec 2018	Difference in height			
ALTILLO	2.480,00	5.356,60	2.876,60	115,99%	25%	
ELVECIA	1.158,00	16.613,50	15.455,50	1334,67%	25%	
GABRIELAS	1.561,00	3.431,90	1.870,90	119,85%	25%	
GONZALO	896,00	19.150,20	18.254,20	2037,30%	25%	
HATO VIEJO**	1.416,40	1.995,20	578,80	40,86%	25%	
HERRADURA	777,90	3.759,30	2.981,40	383,26%	25%	
PALIZADA	1.453,00	30.369,60	28.916,60	1990,13%	25%	
PITAYAS	7.260,00	10.808,70	3.548,70	48,88%	25%	
RUIZ	152,00	2.105,60	1.953,60	1285,26%	25%	
TARABITA 1	4.703,00	10.292,60	5.589,60	118,85%	25%	
TARABITA 2	4.621,90	6.807,20	2.185,30	47,28%	25%	
YACUANAS BAJO	3.021,00	4.322,60	1.301,60	43,09%	25%	
YUNGA	3.725,00	6.901,90	3.176,90	85,29%	25%	
Total general	33.225,20	121.914,90	88.689,70	266,94%	25%	

Figure 9.- The overall growth achieved was 266.94%, compared to 25% of the required objective.















Name of Veredas	% Water Saving		KPI's Water Saving
	Achieved Phase 1 Dec 2018	% Water Saving Accepted Objective	
ALTILLO	100,00%	90%	
ELVECIA	98,46%	90%	
GABRIELAS	89,38%	90%	
GONZALO	100,00%	90%	
HATO VIEJO**	78,57%	90%	
HERRADURA	100,00%	90%	
PALIZADA	100,00%	90%	
PITAYAS	99,05%	90%	
RUIZ	91,67%	90%	
TARABITA 1	94,56%	90%	
TARABITA 2	98,13%	90%	
YACUANAS BAJO	100,00%	90%	
YUNGA	100,00%	90%	
Total general	95,55%	90%	

Figure 10.- The% water savings achieved was 95.55% compared to 90% of the required objective.

** It should be noted that the veredas of Gabrielas and Hato Viejo affect this%.














Name of Veredas	% Harvest Obtained Phase 1 - Dec 2018	% Harvest Objective Year 1	KPI's Harvest Year 1
	ALTILLO	0,00%	0%
ELVECIA	96,92%	0%	
GABRIELAS	0,00%	0%	
GONZALO	100,00%	0%	
HATO VIEJO**	0,00%	0%	
HERRADURA	0,00%	0%	
PALIZADA	100,00%	0%	
PITAYAS	0,00%	0%	
RUIZ	0,00%	0%	
TARABITA 1	0,00%	0%	
TARABITA 2	0,00%	0%	
YACUANAS BAJO	0,00%	0%	
YUNGA	0,00%	0%	
Total general	22,13%	0%	

Figure 11.- Elvecia, Gonzalo and Palizada obtained passion fruit crops. These groups make up 22.13% of crops obtained in comparison with the objective of the first year planned with 0% of crops.















Name of Veredas	% Reused Waterboxx Phase 1 - 2018	% Reused Waterboxx Objective Year 1	KPI's Waterboxx Reutilizados
ALTILLO	0,00%	80%	
ELVECIA	96,92%	80%	
GABRIELAS	0,00%	80%	
GONZALO	100,00%	80%	
HATO VIEJO**	0,00%	80%	
HERRADURA	0,00%	80%	
PALIZADA	100,00%	80%	
PITAYAS	0,00%	80%	
RUIZ	0,00%	80%	
TARABITA 1	0,00%	80%	
TARABITA 2	0,00%	80%	
YACUANAS BAJO	0,00%	80%	
YUNGA	0,00%	80%	
Total general	22,13%	80%	

Figure 12.- Elvecia, Gonzalo and Palizada reused their Groasis Waterboxx® in their passion fruit crops. In the initial plan, it was planned that by year 1, we would have 80% of reused devices. The remaining% of Waterboxx® will be used in the next phase.

Sustainable Restoration of the land with the Groasis Ecological Water Saving Technology - Zero Hunger Project by 2030 - Phase 1				
December 2018				
Project KPI's and Objectives PHASE 1 : GROASIS WATERBOXX				
Primary KPI's	Present	1 Year Objective (original proposed plan)	Comments and Observations	
1	# of trees planted	985	2000, 2800	February 2018, 985 Waterboxx were planted with fruit trees.
2	# of beneficiaries involved in the project	197 - 591	200, 160	197 Direct beneficiaries. 591 indirect beneficiaries. There are 197 women direct beneficiaries in Phase 1 - However, we could consider an average of 3 people per Waterboxx, which means that around 591 people participate directly and indirectly in this phase of the project.
3	# of survived trees	91,17%	90% (1800)	898 trees equivalent to 91.17% of the total fruit trees delivered in Phase 1.
4	# of hectares planted (land restored)	4,71	10, 14	With Waterboxx
5	Water saving (liters of water per tree)	96%	90%	One of the advantages of Waterboxx is the saving of water up to 90% in areas where there is a shortage of vital fluid.
6	Growth speed (tree length)	266,94%	25%	Waterboxx accelerates the growth of fruit trees.
7	Increase in biodiversity and fertility of degraded land Survival rate of trees planted for land restoration purposes.	91,17%	90%	898 live trees (91,17%)
8	Ability to feed the local community KG of food produced by the beneficiaries by Waterboxx®.	500 kg	5kg, 20kg	Palizada, Gonzalo and Elvecia have harvested 500 kg of large, fleshy passion fruit, with good flavor.
9	Lower cost of feeding the local community Cost / kg of crop produced.	0%	-25%	In the Phase 1, families have not invested a single peso.
10	Greater nutritional diversity Amount of crops grown in Waterboxx®.	5 different species of fruit trees	2	Avocado Lorraine; Mora Castilla, Passion Fruit, Papaya Tahinu y Lemon Tahiti. All fruit species were chosen by the beneficiaries of the participating groups.
11	Gender equality and age Good distribution among WFP beneficiaries with equal division	197	Male-Female- Age groups.	Directly: 197 women beneficiaries ranging between 20 and 65 years. Average age: 42.5 years Indirectly: we have the support of the husbands and families of the participants.
12	Ability to be productive in small farms with worse soil quality Checking the difference in productivity kg of crop / box.	All the families have followed the instructions and planted the fruit trees with Groasis Waterboxx	<50% difference	The plantations of the fruit trees with the Groasis Waterboxx have greatly improved the quality of the soil, considering that most of these lands were either unproductive or with seasonal crops. The families were trained and coached with the Groasis Technology, as well as the eco-friendly phytosanitary control, which has allowed diversifying new non-common crops in the area.
13	Exponential Growth Number of Waterboxxes® that have been reused	22%	80% after 1 year	In Phase 1, 218 Waterboxx (22.13%) have been reused with passion fruit trees. For Phase 2, 100% of the devices will be reused.
14	Exponential growth Percentage interested in acquiring additional Growboxxes®	Information available in the following Phase	20%, 50%	Information available in the following Phase

Figure 13.- Project KPI's and Objectives Phase 1 – Summary

2.5.3 Conclusions of Phase 1

In Phase 1, the passion fruit trees of Gonzalo, Palizada and Elvecia surprised us with overwhelming results. These veredas maintain their Groasis Waterboxx® devices around the trees as a source of water for their crops. They do not take them off and re-use them.

In the other participating villages: crops are expected soon in Mora Castilla and Papaya. The perennial crops of Limón Tahiti and Avocado are progressing satisfactorily.

The Mora, Papaya, Limon Tahiti and Avocado trees are found without Groasis Waterboxx®. The devices were removed in the month of November 2018.

Groasis Technology offers the recognized Waterboxx® as a direct response to land degradation due to overpopulation, lack of water, climatic adversity, desertification and overexploitation. We can detail each of the following points as an **added value** that differentiates Groasis from any other conventional irrigation system:

- Productivity and business model: As in the case of Palizada, where already in the Sixth Monitoring we had the pleasant news that they have harvested 420 pounds of passion fruit, the same ones that have been commercialized at the town fair at \$ 3,000 COP per kilo.
- Food security: Each of the participating members will receive the fruits they harvest for family consumption in a timely and permanent manner.
- Gender and age equality: We have the support not only of women members of AMURA, but of men and sometimes, of the curiosity of children who wish to participate in some way, thus promoting family union.
- Creation of a Circular Economy Model: where we highlight the **3Rs** - **Reuse**, **Recycle** and **Reduce**. The Groasis Waterboxx® can be reused 10 to 15 times, up to twice a year. We **Reuse** and **Recycle** the Groasis Waterboxx®, and **Reduce** the consumption of water used in crops (initial sowing with 16 liters per box): with water savings we avoid the presence of pests and diseases: we do not use electricity; We do not pay maintenance costs for pipes, pumps in conventional irrigation systems; creating a sustainable production of fruit trees for family consumption and for marketing in surplus markets.
- Ecologically friendly system with vulnerable ecosystems.

Thanks to the support of the UN World Food Programme Offices, the continued support of Groasis Holland and the contribution of Inquiring Systems Inc, we carried out a Phase 2 from January 2019, where the latest biodegradable Groasis Growboxx® was implemented with a combination of 1 fruit tree and 4 short-cycle vegetables.



Karen Males and Elmer Gaviria of Hato Viejo in planting day with Groasis Waterboxx®. Photo taken 20180420.



Group of women beneficiaries in Tarabita 1, with a papaya tree (7 months) with Groasis Growboxx.®Photo taken 20190826

2.6 Phase 2: Implementation of the Groasis Growboxx® (January-June 2019)

In January 2019, Phase 2 of the project “Sustainable Land Restoration with the Groasis Ecological Water Saving Technology - ‘Zero Hunger by 2030’ Project begins with the training and implementation of the award-winning Groasis Growboxx®, the new member of the Groasis Technology. The Groasis Growboxx® is a biodegradable paper pulp device with which we verify, not only, that we can combine fruit trees with short-cycle vegetables guaranteeing a sustainable food production system (food security for participating families) but also, overcome the challenges that arise: climatological, social, ideological and turn the life of this group of rural women with the help of a business model by marketing their surplus crops: generating income that improves their quality of life, promoting their participation in economic activities and the contribution to their homes and their association and Municipality In Phase 2, we continue with the monitoring and data collection of the fruit trees planted at the beginning of 2018, with the Groasis Waterboxx®.

The amazing results obtained until the end of 2018, with the passion fruit crops in Groasis Waterboxx®, inspired and motivated us to maintain the continuity of a new phase with our strategic partners, despite the tight and almost scarce budget we have for the development of activities in 2019.



Woman with her daughter on planting day in Casablanca. Start Phase 2 with Groasis Growboxx®, in combination with fruits and vegetables. Photo taken 20190311.

In Phase 2, we had:

- **14 participating veredas:** Pitayas, Herradura, Yunga, Altillo, Yacuanas, Gonzalo, Palizada, Tarabita 1, Gabrielas, Sauji, Casa Blanca, Achiral, Cerro Largo y Juan Ruiz.
- **200 women directly involved** in the Project.
- **966 Groasis Growboxx®** used.
- **966 seedlings of fruit trees delivered:** Tangerine Oneco (*Citrus bobilis*), Lemon Tahiti (*Citrus Latifolia*), Avocado Lorraine (*Persea americana*), Tree Tomato (*Solano Betaceum*), Papaya Tahinu (*Carica papaya*), Mango Tommy (*Mangifera Indica*).
- **3864 between seedlings and seeds of short-cycle vegetables species delivered:** Beans (*Snap Bean Lago Azul*), Green Pepper (*California Wonder 300*), Tomato Chonto (*Santa Clara*), Cucumber(*Poinsett 76*), Lettuce (*Black Seeded Simpson*), Pea, Watermelon (*Daytona*), Cabbage (*Bobcat*).
- Data recording and evaluation methods are taken monthly with the agronomic variables already established with the Groasis Waterboxx®.
- Contribution of the UN World Food Programme - Pasto Office, for the purchase of fertilizers such as: Triple 15, Lime, Magnesium Sulfate and Boron.



Juan David Inchima (9) with an avocado tree planted in Groasis Growboxx® #700. First Monitoring- Phase 2. Photo taken 20190311. (4 months planted).

2.6.1 Results of Phase 2

During the first half of 2019, the monitoring continued to be carried out monthly. Data collection gives us optimal results with the combination of short-cycle vegetables and fruit trees thanks to the intervention of Groasis Growboxx® Technology.

100% of the participating villages that implemented the Groasis Growboxx® at the beginning of 2019, obtained short-cycle vegetable crops, which were destined on this first occasion to:

- feeding of the families of each participating village (food security of the beneficiary villages),
- Germinator seeds for a new planting (replicable vegetative material).



Groasis Growboxx® # 665 with tree tomato fruit of 64 cm in combination with cabbage and tomato in The Herradura vereda. Phase 2 monitoring. Photo taken 20190617 (4 months planted).



Groasis Growbox® # 74 with a tangerine tree of 52 cm in combination with cucumbers on Tarabita 1 vereda. Monitoring Phase 2. Photo taken 20190620 (4 months planted).



Panoramic view of papaya trees planted with Groasis Growboxx® on Palizada. 4 month plantation. On the back, the passion fruit cultivation with Groasis Waterboxx® is observed. Photo taken: 20191120

In Phase 2, the Groasis Waterboxx® continues to give excellent results.

Harvesting continues on papaya, passion fruit and blackberry crops; obtaining fruits that allow to feed the families and commercialize in the peasant market.

In Gonzalo, 65 Waterboxxes® devices produced an initial harvest of approximately 350 kilos of passion fruit (1,400 units).

The passion fruit (passion fruit) harvested has very good fruit, they are large and fleshy.

In the market, production is marketed by dozens. Each dozen is priced at 3,000 pesos COL.

This means that the beneficiaries obtained an income of 350,000 pesos COL (108 USD) in the commercialization of this first harvest, product of the initial 65 Waterboxxes®.

Suppose the trees survive 20 years, then the use of a Waterboxx® for one year, while the plantation causes 40 crops x 1.66 = 66.46 USD, while the unique cost of Waterboxx® to plant a tree is 1 USD.

Each box multiplies the investment 66 times.

Waterboxx® can be reused for approximately ten years.



Passion fruit trees planted with Groasis Waterboxx® in Gonzalo. Photo taken: 20190619

Palizada has 90 Groasis Waterboxx® devices, they continue using the devices as sources / reservoirs of water for their trees.

So far, they have harvested twice and have a third harvest date in a few days from this visit. In both crops, they harvested approximately 980 kilos of large, fleshy and good-tasting fruits. Its productions have been commercialized in the Almaguer market, at 3,000 pesos per dozen. This represents total income of 980,000 pesos COL (303 USD) that benefit the progress of the members of the village. This is a sale per box after twelve months of 3.35 USD.

Suppose the trees survive 20 years, then the use of a Waterboxx® for one year, while the plantation causes 20 crops x 3.35 = 67 USD. The unique cost of Waterboxx® per tree is 1 USD. Each box multiplies the investment 67 times.

Waterboxx® can be reused for ten years.

It is a very organized and responsible group, whose leader Hermilda Hoyos gives us a video testimony in the following link see [a testimonial](#)



My name is Hermilda Hoyos from Palizada, Municipality of Almaguer
 Testimonial World Food Programme: two yields with Groasis Waterboxx® plant cocoon within 1 year

Elvecia received 65 Groasis Waterboxx® with passion fruit trees on the pilot.

They have not removed their Waterboxx® devices, they keep them as a source of water for their passion fruit crops.

Elvecia, represented by Doña Aurelia López, has harvested approximately 100 kilos of passion fruit, with large, fleshy and good-tasting fruits, the result of its 65 Waterboxx® planted in February 2018.

Elvecia sold the passion fruit in the Almaguer market, which represented economic income of \$ 100,000 COP pesos, values that have been destined for the benefit of all the members of the participating village.



Panoramic view of Elvecia cultivation of passion fruit with Groasis Waterboxx®. Photo taken 20190619

The village Gabrielas, has obtained a first harvest of approximately 70 kilograms of Mora Castilla, whose commercialization in the peasant market was 6000 pesos COP.



Blackberries Castilla in Gabrielas, without Groasis Waterboxx®. Photo taken 20190315.

On Tarabita 1, the Groasis Waterboxx® were removed from the papaya crop.

On Tarabita 1, papaya trees have an average height of 2.21 meters (221 cm.) and up to 20 fruit units per tree have been harvested.

The papaya crop was destined for family consumption (food security).



Papaya trees in Tarabita 1, without Groasis Waterboxx®. Photo taken 20190314.

The miracle of this project is based on the fact that all the results achieved during Year 1 have been achieved without using drip irrigation.

Groasis Technology guarantees the availability of water during particularly severe periods of drought, and particularly, for seedlings that depend on higher humidity cycles to germinate and survive.

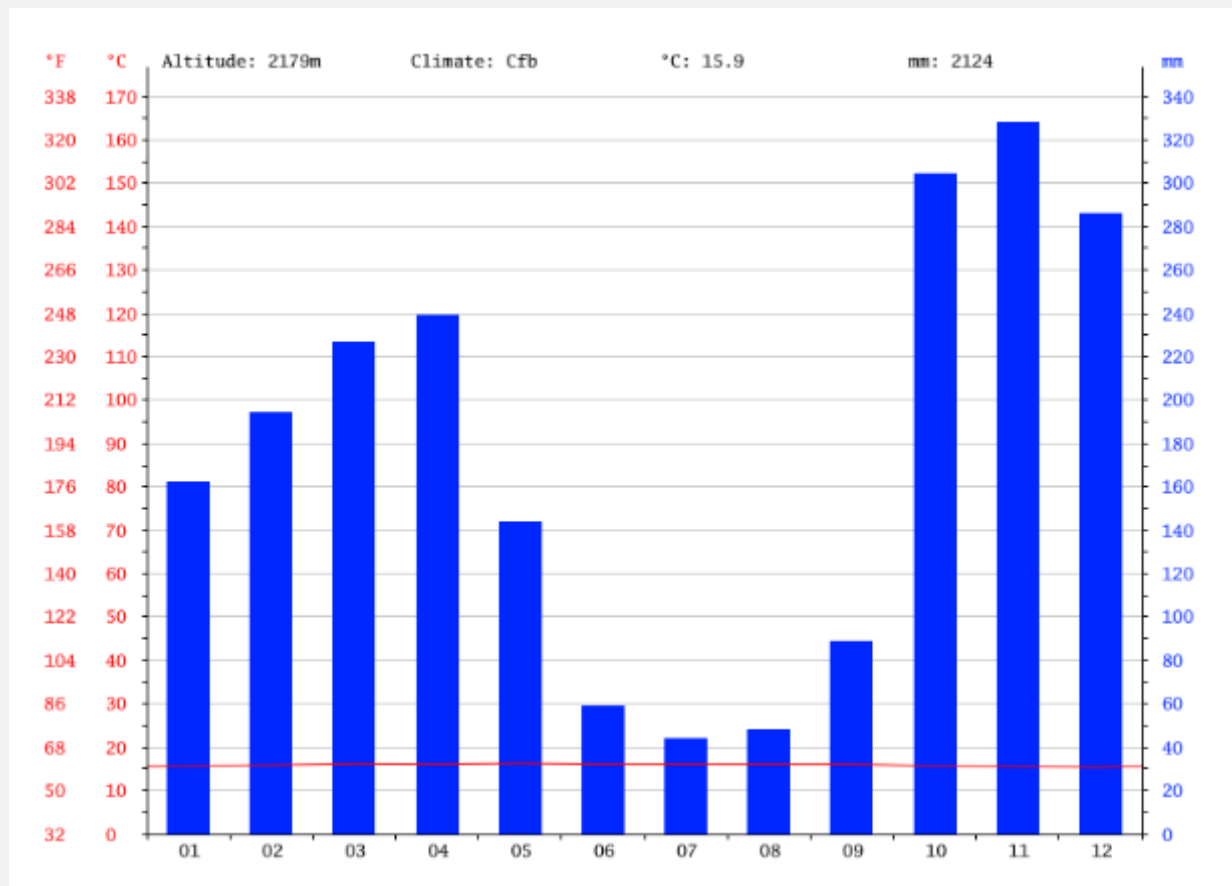


Figure 14.- Climate graph of Almaguer: Precipitation is lower in July, with an average of 44mm. Most of the precipitation falls in November averaging 328 mm.

Although the area has rainfall for short periods of time, its dry cycles, which are called "Summer," are long and hot.

For this reason, planting is difficult, and there is no capital to invest in expensive wells, pumps, a water transport network or an electrical network, while the distances are large and the slopes of the land are very steep.

Groasis Ecological Water Saving Technology has proven its reliable results, once the trees have deep roots, they grow well and no more irrigation is needed.

2.7 Phase 3: Economic Model with the Reuse of Groasis Waterboxx® (July-December 2019)

The development of Phase 3 is possible thanks to the financial support of the office of GROASIS, the support of USA based IS Inc. and Mental Insight Foundation, as well as the contribution for mobilization and transport expenses of the UN World Food Programme Office - PMA Pasto.

Complying with the original plan, in Phase 3 we have obtained a scalable economic model where women participate with their own funds for the continuity of the program.

In this phase, we not only intend to demonstrate the theory that Groasis Waterboxx® can be reused 10 to 15 times, but we also create an interesting model where the economic funds obtained from the commercialization of the acquired crops can be reinvested with the purchase of the trees for reseeded and continue replicating on the veredas with their own economic means.

To develop the Third Phase of the project, we have decided that the seedlings of fruit trees that will be sown in the reused Groasis Waterboxx®, are acquired / purchased by AMURA as a representative entity of the participating women.

In Phase 3, we demonstrate the pro-activity and total commitment of the beneficiaries as well as the success of the crops with the Groasis Waterboxx®, based on the experience obtained since 2018.

In phase 3, we wanted to prove that we have obtained a scalable economic model through asking the participating communities to pay for their own saplings. All of them accepted the proposal and this indicates the success of this scalable model. The Groasis Waterboxx® is a preponderant element of this scalable model, due to its characteristic of being reused up to 15 times. The Groasis Waterboxx® is a viable product whose basic functions allow this productive project to be replicated in the same veredas, or in new member village of the Association AMURA, for years to come.

The scalable economic model would be:

YEAR 1: Sponsorship / Subsidy / Donation of Groasis Waterboxx® Technology, vegetative material, training and coaching by the donor entity, in this case, the UN World Food Programme.

YEAR 2: Project beneficiaries finance 100% of the vegetative material to be used with the reuse of Groasis Waterboxx®. Training and measuring data will be paid for by UN World Food Programme.

YEAR 3 - onwards: Groasis Waterboxx® continues to optimize its use and the beneficiaries maintain the acquisition of trees as plantations are replicated and economic income is obtained from the commercialization of crop surpluses.

In phase 3, we have:

- **17 participating veredas:** between crops with Groasis Waterboxx® and Groasis Growboxx® who have paid their own planting material! It means that the results are so good that this model becomes scalable.
- **200 women directly involved** in the project.
- **966 reused Groasis Waterboxx®** (98,07% of the overall total).
- **966 seedlings of fruit trees delivered:** Tangerine Oneco (*Citrus bobilis*), Lemon Tahiti (*Citrus Latifolia*), Avocado Lorraine (*Persea americana*), Tree Tomato (*Solano Betaceum*), Papaya Tahinu (*Carica papaya*), Mango Tommy (*Mangifera Indica*).
- Data recording and evaluation methods are taken monthly with the agronomic variables already established with the Groasis Waterboxx®.



Achiral Group in the implementation of Phase 3 with Groasis Growboxx®. Photo taken 20190313.

2.7.1 Results of Phase 3

The vereda Gabrielas presented in the pilot and phase 1, a considerable loss of Mora Castilla seedlings (previous KPLs), this because the cultivation of Mora Castilla is very vulnerable in periods of precipitation due to the flooding of the soil that generates root asphyxiation and appearance of Botrytis (fungi).

From this initial experience, the participants followed the recommendations given to counteract the edaphoclimatic effects, such as draining near each Groasis Waterboxx® and fumigating with Copper Sulfate

For Phase 2 and Phase 3, the Mora Castilla plantation reflected significant growth, strong stems, young and growing leaves; in general, vigorous and completely healthy plants, fertilized with animal manure.

Gabrielas reports a second harvest of approximately 150 kilograms, which has been destined for the feeding of the families and the remaining product in the commercialization in the peasant market. The sale price of each kilo is \$ 6,000 pesos COL.

We can summarize that from the beginning of the pilot to Phase 3, the village Gabrielas has harvested approximately 220 kilograms of Mora Castilla, obtaining economic income for \$ 1,320,000 Pesos COP.

The values obtained in the sale are destined for the benefit of the village in general.



The cultivation of tree tomatoes (tree tomato is the local common name. These are the real names: Tamarillo = *Cyphomandra betacea*). In the Groasis Growboxx® reach an average height of 1.35 meters within 6 months. Currently, they are in the process of flowering.

Its fertilization plan is with rabbit manure every 15 days.

Fumigation continues every 15 days, to avoid the presence of head lice.

The fertilization of vegetables should be done with magnesium sulfate, according to the recommendations given above.

The Groasis Growboxx® creates a cooler microclimate inside the box, as we can see in the photos below. The temperature inside the Growboxx® is 27.9 ° C, while outside it is 30.1 ° C.

A more proven advantage of the Groasis Growboxx®!



Ms. Oliva Córdova, Gabrielas leader checks the temperature difference between the interior and exterior of the Groasis Growboxx®. Growboxx® indoor temperature: 27.9 ° C while the outdoor temperature is 30.1 ° C

Gonzalo had a second crop of trees planted with the Groasis Waterboxx®. They obtained in this new harvest with 400 pounds (181.44 kilos) of large passion fruit and with sweet pulp. 70% of the production (280 pounds / 127 kilos) has been destined for commercialization in the market. Generating economic income for the benefit of the members of the village for \$ 127,000 pesos COP.

30% of the remaining production (120 pounds / 54.44 kilos) was for family consumption.

We can summarize that from the beginning of the pilot to Phase 3, the Gonzalo vereda has harvested 531.44 kilos of passion fruit (1172 pounds).

477 kilos were sold, producing income for \$ 477,000 pesos.

The resources obtained in the sales are used to support the families.

In this vereda, papaya crops with the Groasis Growboxx® are growing and a variety of short-cycle vegetables have been obtained for family consumption.

Palizada keeps the Groasis Waterboxx® as water reservoirs for its passion fruit trees. For Phase 3, Palizada had a third harvest where they have obtained more than half a ton of passion fruit, large and desirable fruit in the peasant market.

We have an updated testimonial video, by Doña Hermilda Hoyos, where she shows us her fantastic passion fruit crops with Groasis Waterboxx® and short-cycle papayas / vegetables with Groasis Growboxx®.



20191114 Palizada - Hermilda Hoyos.mp4

We can summarize, that the Palizada vereda from the beginning of the pilot to date in Phase 3, has harvested 1480 kilos of passion fruit, which have been destined for commercialization in the peasant market generating economic income for \$ 1,480,000 Pesos COP.

The village Tarabita 1, until the end of this edition, have obtained **approximately 400 papayas**. **They have sold 250 papayas at a price of \$ 2,500 COP pesos (\$ 625,000 Pesos COP)**. The remaining fruit units have been used for family consumption (food security). A new harvest is expected, by the beginning of 2020.



Jeyson Castaño in the crop of papaya in Tarabita 1, without Groasis Waterboxx®. Papaya's tree have more than 2meters high. Photo taken 20191122.



Doña Sandra Quiñonez, leader of the Vereda Tarabita 1, shows us how the Groasis Waterboxx® creates a special microclimate type “incubator” inside the box that helps the growth and development of trees. Waterboxx® indoor temperature: 34.8 ° C while the outdoor temperature is 39.2 ° C.

Lemon Tahiti trees planted with Groasis Waterboxx® at the beginning of 2018 (5 veredas: Altillo, Pitayas, Tarabita 1, Yacuanas, Yunga) are progressing successfully, vigorous plants with strong stems and green leaves free of pests or diseases.

The harvest time for these crops is 2.5 years.

From the second half of 2020, harvests and production results are expected.

Lorena Avocado crops planted with Groasis Waterboxx® from the pilot (2018), have presented certain difficulties, with symptoms of wilting, leaf fall and descending necrosis from the crown to the root.

After an arduous analysis, it can be diagnosed that the acquired seedlings presented **phytophthora** fungus since its acquisition in the nursery, we assume inoculated from the seed in its germination.

Despite all the monitoring and recommendations given to these crops, there is a considerable percentage of mortality in the Avocado Lorraine crops, implemented in Altillo, Tarabita 1, Yacuanas and Yunga.

Currently, in each monitoring the recommendations of the Fumigation and Fertilization treatments are continued to avoid a greater increase in mortality in this vegetative material.

The fruits of Tree Tomato and papaya planted with the Groasis Growboxx® at the beginning of 2019, have significant growth.




Papayas in Growboxx® have an average of 8 fruits per tree within a period of 9 months after planting.

Mandarin and mango trees planted with Groasis Growboxx® are vigorous and strong, without pests or diseases.

2.7.2 Performance Indicators KPI – Phase 3 - Information to December 2019

Sustainable Restoration of the land with the Groasis Ecological Water Saving Technology - Zero Hunger Project by 2030 - Summary of Phases				
DECEMBER 2019				
KPI's del Proyecto y Objetivos FASE 3 : GROASIS WATERBOXX				
	Primary KPI's	Present	1 Year Objective (original proposed plan)	Comments and Observations
1	# of trees planted	1951	2000, 2800	Pilot Phase: February 2018, 985 Waterboxx were planted with fruit trees. Phase 3: July 2018, 966 Waterboxx with fruit trees were reused. Total trees planted with Groasis Waterboxx: 1,951
2	# of beneficiaries involved in the project	197 direct beneficiaries- 591 indirect beneficiaries	200, 160	Pilot Phase: 197 Direct beneficiaries. 591 indirect beneficiaries. Phase 3: We remain with 197 women direct beneficiaries - However, we could consider an average of 3 people per Waterboxx, which means that around 591 people participate directly and indirectly in this phase of the project.
3	# of survived trees	87,21%	90% (1800)	Pilot Phase: 859 trees equivalent to 87.21% of the total fruit trees delivered at the beginning of 2018. Phase 3: Trees planted with reused Waterboxx, we will not measure them for this information table, due to the few days planted.
4	# of hectares planted (land restored)	9,42	10, 14	With Waterboxx the productive projects are replicated, by the reuse of the devices.
5	Water saving (liters of water per tree)	94%	90%	One of the advantages of Waterboxx is the saving of water up to 90% in areas where there is a shortage of vital fluid.
6	Growth speed (tree length)	259,47%	25%	Waterboxx accelerates the growth of fruit trees, despite the extreme edaphoclimatic factors of the area.
7	Increase in biodiversity and fertility of degraded land Survival rate of trees planted for land restoration purposes.	87,21%	90%	Pilot Phase: 859 trees equivalent to 87.21% of the total fruit trees delivered at the beginning of 2018. Phase 3: Trees planted with reused Waterboxx, we will not measure them for this information table, due to the few days planted.
8	Ability to feed the local community KG of food produced by the beneficiaries by Waterboxx®.	2631	5kg, 20kg	Tarabita harvested 400 kilos of papaya, Gabrielas harvested 220 kilos of blackberry, Gonzalo harvested 531 kilos of passion fruit, Palizada harvested 1480 kilos of passion fruit. 85% of the totality of this production has been destined for commercialization in the peasant market. The remaining 15% was allocated to food security for families.
9	Lower cost of feeding the local community Cost / kg of crop produced.	\$ 1.700.300,00	-25%	For Phase 3, the beneficiaries acquired the seedlings with their own resources. The purchase value was \$ 1,700,300 COP pesos (\$ 515 dollars)
10	Greater nutritional diversity Amount of crops grown in Waterboxx®.	5 different species of fruit trees	2	Passion fruit: intended for marketing. Mora Castilla: intended for family nutrition and commercialization. Papaya: intended for the nutritional support of families. Avocado Lorena: still not harvested. Lemon Tahiti It is not yet harvested.
11	Gender equality and age Good distribution among WFP beneficiaries with equal division	197 direct beneficiaries- 591 indirect beneficiaries	Male-Female-Age groups	Directly: 197 women beneficiaries ranging between 20 and 65 years. Average age: 42.5 years Indirectly: we have the support of the husbands and families of the participants.
12	Ability to be productive in small farms with worse soil quality Checking the difference in productivity kg of crop / box.	33%	<50% difference	33.20% of crops have been obtained, in passion fruit, blackberry and papaya crops. For the crops of Limón and Aguacate, the crops are expected from the second half of 2020. The plantations of fruit trees with the Groasis Waterboxx have greatly improved the quality of the soil, considering that most of these lands were either unproductive or with seasonal crops . The families were trained and coached with the Groasis Technology, as well as the eco-friendly phytosanitary control, which has allowed diversifying new non-common crops in the area.
13	Exponential Growth Number of Waterboxxes® that have been reused	98%	80% after 1 year	In Phase 3, 966 Waterboxx (98.07%) have been reused diversifying crops in the area.
14	Exponential growth Percentage interested in acquiring additional Growboxxes®	10%	20%, 50%	To make these types of decisions, the villages need to obtain results of not less than 3 years to acquire tools that increase crop productivity and economic income.

Figure 15.- Summary of KPI's Project and Objectives

KPI (Performance Indicators)	
	Reach or exceed the objective fulfillment
	Below target
	Significantly less than the objective

Name of de Veredas	N°women directly benefited Phase3 Dec2019	N° Waterboxx given to the Project	N° Planted trees Feb2018	N° Bob Surviving Trees Dec2019	Total Surviving Trees Feb2018 - Dec2019
ALTILLO	12	60	60	7	53
ELVECIA	13	65	65	2	63
GABRIELAS	16	80	80	17	63
GONZALO	13	65	65	0	65
HATO VIEJO	21	105	105	45	60
HERRADURA	10	50	50	0	50
PALIZADA	18	90	90	0	90
PITAYAS	21	105	105	2	103
RUIZ	6	30	30	5	25
TARABITA 1	25	125	125	13	112
TARABITA 2	16	80	80	10	70
YACUANAS BAJO	10	50	50	5	45
YUNGA	16	80	80	20	60
Total general	197	985	985	126	859

Figure 16.- Detail of the benefited veredas, number of participants, number of Groasis Waterboxx® and seedlings delivered, surviving trees.















Name of de Veredas	% Total Survived Achieved Phase3 - Dec2019	% Survival Accepted Objective	KPI's Survival Achieved
ALTILLO	88,33%	90%	
ELVECIA	96,92%	90%	
GABRIELAS	78,75%	90%	
GONZALO	100,00%	90%	
HATO VIEJO	57,14%	90%	
HERRADURA	100,00%	90%	
PALIZADA	100,00%	90%	
PITAYAS	98,10%	90%	
RUIZ	83,33%	90%	
TARABITA 1	89,60%	90%	
TARABITA 2	87,50%	90%	
YACUANAS BAJO	90,00%	90%	
YUNGA	75,00%	90%	
Total general	87,21%	90%	

Figure 17.- The overall survival achieved was 87.21%. The crops of Mora Castilla and Aguacate Lorena influence these indicators.















Name of de Veredas	% Mortality Phase3- Dic2019	% Mortality Accepted Objective		KPI's Mortality
ALTILLO	11,67%	10%		
ELVECIA	3,08%	10%		
GABRIELAS	21,25%	10%		
GONZALO	0,00%	10%		
HATO VIEJO	42,86%	10%		
HERRADURA	0,00%	10%		
PALIZADA	0,00%	10%		
PITAYAS	1,90%	10%		
RUIZ	16,67%	10%		
TARABITA 1	10,40%	10%		
TARABITA 2	12,50%	10%		
YACUANAS BAJO	10,00%	10%		
YUNGA	25,00%	10%		
Total general	12,79%	10%		

Figure 18.- The overall mortality reached was 12.79%. The crops of Mora Castilla and Aguacate Lorena influence these indicators.














Name of de Veredas	IN CENTIMETERS			% Growth Achieved Phase3 Dec2019	% Growth Accepted Objective	KPI's Growth
	Initial Height Feb2018	Final Height Dec2019	Difference in Height			
	ALTILLO	2480	4863,2			
ELVECIA	1158	16613,5	15455,5	1334,67%	25%	
GABRIELAS	1561	3431,9	1870,9	119,85%	25%	
GONZALO	896	19150,2	18254,2	2037,30%	25%	
HATO VIEJO	1416,4	1995,2	578,8	40,86%	25%	
HERRADURA	777,9	3759,3	2981,4	383,26%	25%	
PALIZADA	1453	30369,6	28916,6	1990,13%	25%	
PITAYAS	7260	10808,7	3548,7	48,88%	25%	
RUIZ	152	2105,6	1953,6	1285,26%	25%	
TARABITA 1	4703	10292,6	5589,6	118,85%	25%	
TARABITA 2	4621,9	6442,2	1820,3	39,38%	25%	
YACUANAS BAJO	3021	4082,7	1061,7	35,14%	25%	
YUNGA	3725	5518,3	1793,3	48,14%	25%	
Total general	33225,2	119433	86207,8	259,47%	25%	

Figure 19.- The overall growth reached was 259.47%. The "incubator" microclimate of the Groasis Waterboxx® speeds up the growth of trees.

Name of de Veredas	% Water Saving		
	Achieved Phase3- Dec2019	% Water Saving Accpeted Objective	KPI's Water Saving
ALTILLO	94,17%	90%	●
ELVECIA	98,46%	90%	●
GABRIELAS	89,38%	90%	●
GONZALO	100,00%	90%	●
HATO VIEJO	78,57%	90%	●
HERRADURA	100,00%	90%	●
PALIZADA	100,00%	90%	●
PITAYAS	99,05%	90%	●
RUIZ	91,67%	90%	●
TARABITA 1	94,56%	90%	●
TARABITA 2	93,75%	90%	●
YACUANAS BAJO	95,00%	90%	●
YUNGA	87,50%	90%	●
Total general	93,57%	90%	●

Figure 20.- The% of water savings achieved was 93.57% compared to 90% of the required objective.

Name of de Veredas	% Reused Waterboxx reutilizados Phase3- Dec2019	% Reused Waterboxx Objective after 1 year	KPI's Reused Waterboxx
	ALTILLO	100,00%	80%
ELVECIA	100,00%	80%	●
GABRIELAS	100,00%	80%	●
GONZALO	100,00%	80%	●
HATO VIEJO	100,00%	80%	●
HERRADURA	100,00%	80%	●
PALIZADA	100,00%	80%	●
PITAYAS	100,00%	80%	●
RUIZ	100,00%	80%	●
TARABITA 1	100,00%	80%	●
TARABITA 2	76,25%	80%	●
YACUANAS BAJO	100,00%	80%	●
YUNGA	100,00%	80%	●
Total general	98,07%	80%	●

Figure 21.- For Phase 3, 98.07% of the Groasis Waterboxx® were reused.

Name of de Veredas	% Harvest Achieved	% Harvest Objective	KPI's Harvest
	Phase3-Dec 2019	Year 1	Year 1
ALTILLO	0,00%	0%	●
ELVECIA	96,92%	0%	●
GABRIELAS	78,75%	0%	●
GONZALO	100,00%	0%	●
HATO VIEJO	0,00%	0%	●
HERRADURA	0,00%	0%	●
PALIZADA	100,00%	0%	●
PITAYAS	0,00%	0%	●
RUIZ	0,00%	0%	●
TARABITA 1	36,80%	0%	●
TARABITA 2	0,00%	0%	●
YACUANAS BAJO	0,00%	0%	●
YUNGA	0,00%	0%	●
Total general	33,20%	0%	●

Figure 22.- Elvecia, Gabrielas, Gonzalo, Palizada and Tarabita 1 obtained crops of passion fruit, blackberry and papaya. These groups make up 33.20% of the crops obtained in comparison with the objective of the first year planned with 0% of crops. The remaining crops (lemon and avocado) are planned for the second half of 2020.

2.7.3 Conclusions of Phase 3

With the results of Phase 3 to December 2019, we can conclude that Groasis Technology is the solution to plant trees in desert areas, degraded and unproductive lands, saving vital liquid, guaranteeing survival and growth of plants, creating productive systems that generate economic income.

With Groasis Technology we have tested the assumptions:

- Growboxx® and Waterboxx® worked as planned based on previous tests:
 - Water saving: measured by comparing the water consumption per kg of cultivation of Waterboxx® and Growboxx® with the traditional planting method,
 - Growth speed: comparison of the length of productive trees with trees planted with traditional trees,
 - Productivity: Number of kilos of vegetables per unit (plant / box) versus traditional methods,
 - Survival rate: comparison of mortality between trees planted with Waterboxx® and Growboxx® and trees planted in traditional plantations.

- Growboxx® and Waterboxx® were easily adopted by the beneficiaries of the villages (women farmers, families, community members):
 - Measured by the training provided and the results (survival rate, crop production),
 - Measured by participant adoption and compliance with the reuse of Waterboxx®,
 - Measured by observing the total number of hectares where land restoration has taken place: measured by the number of hectares planted, the survival rate of the trees.
- Growboxx® and Waterboxx® are affordable:
 - Communities need support from public or non-governmental entities that allow them to access productive credits and obtain microcredits for the acquisition of Groasis devices, training, vegetable seeds, fruit trees, etc.
 - However, and despite the economic limitations of the families, in Phase 3 the vegetative material for the reuse of the Waterboxx® was purchased with funds from the AMURA Association.

Groasis Technology has demonstrated how important its intervention is in the social, environmental and economic impact of the areas where it has been implemented.

Groasis Waterboxx® and Growboxx® Technology during drought periods mark a key fundamental proportional to the plant: a microclimate that allows to continue with your photosynthetic functions. Thanks to this microclimate, plants are not at risk of dehydration at the time of their process. The water inside the Groasis Waterboxx® and Growboxx® devices is maintained at an ideal temperature for the plant, in turn when the temperature maintains a constant increase-decrease variation, the temperature inside the Groasis Waterboxx® and Growboxx® devices they will be maintained and will not show significant variation that may affect the plant.

Name of Vereda	Outdoor Temperature in °C	Temperature inside the Groasis Waterboxx®- Growboxx® in °C	Difference °C	Details
El Peñol	29,00	20,80	8,20	The Groasis Waterboxx® and Growboxx® create a microclimate for the plants, keeping them fresh and hydrated. This microclimate improves the root of the plants, like an incubator in a newborn. When it is too hot outside, Groasis Technology keeps the plant cool. Similarly, if the ambient temperature is very low, inside the boxes the microclimate will be warm and delicious for the plant. Whether the ambient temperature is low or high, Groasis Waterboxx® Technology and Growboxx® maintain the ideal microclimate for plants!
Gabrielas	30,10	27,90	2,20	
Gonzalo	23,10	29,10	-6,00	
Herradura	33,20	29,90	3,30	
Palizada	37,30	36,00	1,30	
Pitayas1	24,10	22,40	1,70	
Pitayas2	32,70	30,20	2,50	
Tarabita 1	39,20	34,80	4,40	
Yacuanas	28,20	28,30	-0,10	

Figure 23.- Next, the environmental temperature (outdoor) and the temperature inside the Groasis Waterboxx® and Growboxx® are shown in some veredas during the monitoring, this was taken by two thermohydrometers.

2.8 Acknowledgement

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Without them, I would not have the opportunity to approach any of you. I wish to they continue with their good relationship and continue traveling around the world, making proposals and sharing knowledge, to green the deserts in favor of small farmers and people in vulnerable areas where everything is more complicated due to forgetting and lack of resources.

To my partner, Jeyson Castaño for being loyal and being 100% professionally dedicated to the good development of this program.

And to my team in Guayaquil, who accompany me in all my activities and do everything possible to achieve our goals together.

CPA. Ana Terranova Aranda, GROASIS Ecuador



AMURA GROUP AND GROASIS TEAM. PHOTO TAKEN 20190622