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Large Scale Aquaponic Production Business Plan

BREEN
BREEDED IN GREEN

ECOPONICS

INDEX

1. - Introduction

1.1. - Background

This project has been created by the technical team BREEN SL. This project aims to promote crop diversification and the sustainable production of fish in the Spain while meeting the objectives set by the Master Plan for Aquaculture ACBC 2009-2013.

For this we have chosen a kind species of fish of global importance which is still largely unknown to producers and markets in Spain and even Europe, the Tilapia *(Orechromis niloticus).*
This project aims to create sustainable production of Tilapia focused on three main areas:

- Sustainability in water management, recycling and Aquaponics
- Energy sustainability, renewable energy and energy efficiency
- Sustainability in the food for the production of Tilapia, without dependence on marine resources or the environment.

1.2. - Suitability of Tilapia

There are different species known generically as Tilapia which is one of the biggest fish groups in global aquaculture. Where it is produced, it has resulted both to be a profitable and competitive product that is a good alternative protein with excellent prospects for development.

White meat, solid and neutral in flavor, it is a product that makes its way easily in different world markets to the point of becoming the second most popular farmed fish after carp and surpassing salmon.

Besides its quality, its success is due to its ease of cultivation. It is an easily adaptable species to intensive cropping systems and has a high rate of reproduction, high disease resistance, high survivability, etc. and able to grow well in a wide range of physico-chemical qualities of water.

2. - Methodology

To achieve the objectives outlined, this project follows the guidelines set out below:

- Characterization of the environmental requirements of tilapia from knowledge of its biology
- Delimitation of biomarkers that meet the requirements of this technology as suitable for tilapia.
- Identifying sustainable growing environmental risks and other limiting factors.
- Review and analysis techniques and sustainable farming technologies most suitable for the species in the environmental conditions for its production
- Crop adaptation to environmental risk prevention.
- Marketability, distribution etc., and an analysis of the economic viability of the facility.
- Production volumes
- Calculate investment costing
- Production costing

The whole process is performed by collecting documentation, consultations with specialists in the species, looking at different national and international facilities and the experience gained through the production of the pilot BREEN.

2.1. - Systematic

Under the common name of Tilapia are grouped more than 100 different species, all belonging to the family of cichlids that inhabit both freshwater and brackish in Africa and the Middle East. For its adaptability, meat quality and rapid growth, many of the species that are grouped under the common name of Tilapia they are among the most cultivated species in fish farms on five continents.

For Zootechnical commercial purposes they are often not differentiated between different species of Tilapia.

Taxonomy:

- *Phylum: Cordata*
- *Class: Actinopterygii*
- *Order: Peciforme*
- *Family: Cichlidae*
- *Subfamily: Pseudocrenilabrinae*

- *Gender: Oreochromis*
- *Species: Niloticus*

Orechromis Tilapia niloticus, and Nile tilapia, are herbivorous or omnivorous fish very suitable for cultivation because of the high yields that can be obtained from them, in fact, by far the most widely cultivated species of Tilapia in whole world.

The chromaticity is an aspect that contributes significantly to the differentiation of the different species.

Treatment species O. mossambicus x O. niloticus x O. aureus, has led to the development of a hybrid of great importance for aquaculture called red Tilapia.

Pure Tilapia species are more favorable for growing, however, as has happened in other countries, the activity is geared to growing the red tilapia hybrid form or, as the most environmentally sensitive, offers many more guarantees from the point of view of reproductive success in the wild in the Basque Country and Spain in the event of leakage or uncontrolled releases.

The introduction in recent years of genetic selection techniques has made obtaining pure lines of the same sex (males supermachos or YY), which have eliminated the problem of the viability of the specimens in case of accidental escape.

2.2. - Overview

The origin of the Nile Tilapia is in Africa, occupying the basins of major rivers the African variety has seven distinct subspecies. Subsequently it has spread throughout the world, especially in temperate and tropical America and Asia. It is also grown in industrial, hot water in some parts of Europe.

Nile tilapia has a spindle shape and is of medium size, and is equipped with a midline, following the characteristic pattern of cichlids.

Structurally, the body of Tilapia is laterally compressed, so that it has a blowhole on each side, with scales and appears in some cases cycloid ctenoid. Another distinctive anatomical feature is the presence of numerous spines along the dorsal and anal fin. The operculum is thorny.

There is a significant size difference in growth between males and females.

2.3. - Habitat

Tilapia are euryhaline, ie support a wide range of salt content in the water, being able to live in fresh and brackish envirnoments, although do not tolerate sudden changes in salinity. Tilapia, as a result of these features have colonized diverse habitats such as streams, rivers, lakes, lagoons, brackish and salt etc. In all cases the preference of Tilapias are slow-flowing waters, remaining in shallow areas near the shore where they develop throughout their life cycle.

The natural range of temperature ranges between 20-30 ° C, 24-29 ° C which represent the being optimum for reproduction. Although it can withstand lower temperatures, the mere fact that declines occur and cause fluctuations in the metabolic dysfunctions that result in increased vulnerability to disease, reduced reproductive success and slowdown growth. Temperatures below 15 ° C cause death in the short term and below 10 º C immediate death.

2.4. - Food in natural conditions

Tilapia have herbivorous or omnivorous eating habits. Small aquatic insects, phytoplankton, detritus of different origins and even bacteria comprise their diet. In times of food shortage they can eat their own feces.

As larvae Tilapia sustinance is guaranteed by the nutrients in their yolk sac in their first days of life, which they depend on for an average of 5 days. When the larva has reabsorbed 60-75% of their lipid reserves it is when they begin to forage independently.

Their main food during this first phase in which its digestive system is still not fully developed, are micro algae. These micro algae provide proteins and amino acids necessary for proper development.

2.5. - Fertilization and playback

In the wild, the reproductive phase is carried out when the temperature range is optimal
The male clears an area to make a nest or defends an area for spawning. Later it attracts receptive females by performing courtship displays.

The female then proceeds to lay eggs which are immediately fertilized by the male, after which the female keeps them in her mouth for incubation

The eggs remain within the female's mouth for a period of between 5 and 10 days depending on the water temperature, while developing.

Once hatched, the eggs inside the female's mouth, the fry begin to swim from the mouth of the mother to fee, but returning again at the slightest sign of danger.

Once the size of the fry starts to hinder their stay inside the mother's mouth, they begin to become independent, they move toward warm water and shallow protected enclaves.

The female will be able to make another start in less than four weeks from the release of the fry.

In the wild, the fry mature between 10-12 months, when they reach a weight of about 500-600 grams. Under optimal growth conditions, tilapia can reach sexual maturity at 4-5 months weighing between 150-200 grams.

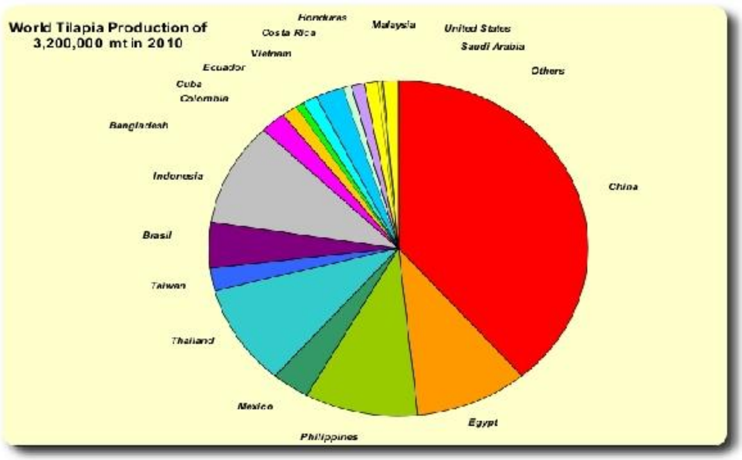
3. - Tilapia farming

3.1. - Global importance of cultivating Tilapia

Tilapia offers competitiveness as hatchery species, because of its high quality, pleasant taste and wide tolerance to different environmental conditions, added resistance to common diseases of farmed fish, their relative ease of reproduction and growth rate in intensive farming.
All these qualities are of high interest for aquaculture, and have led Tilapia to occupy the second most important group of species in world of aquaculture production, after the tents, with a volume of approximately 20% of total farmed fish production and are in a process of continuous growth.

According to the FAO global production of 3.2 million tons in 2010, China was the largest producer contributing about 40% of total world production, followed by Egypt, Indonesia etc.

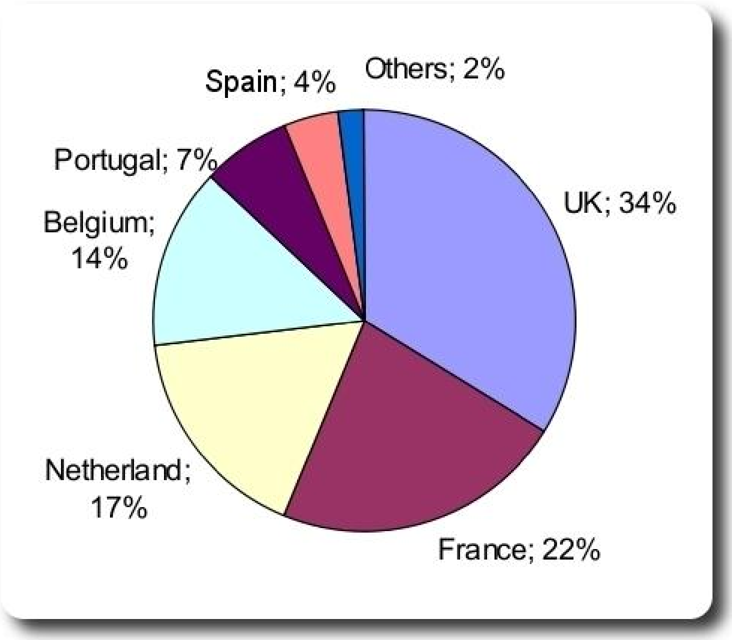
Image 1: World's biggest Tilapia producers



For some years, Tilapia has been the third most imported aquatic food product by the U.S. after shrimp and Atlantic salmon, and has been awarded as the Fish of the Year for 6 consecutive years. In 2010 total consumption of Tilapia was approximately 466,000 tons with exciting growth prospects in the coming years, it will be placed in the top ten products of aquaculture and fisheries sector. Consumption is expected to maintain at a minimum average annual increase of 3%.

Globally, the increase of tilapia production shows strong growth, giving the product a leading role as a first-order food for the future, especially in developing countries, high population areas etc., It is of particular interest as a viable alternative to capture fisheries at a time when fish stocks are overexploited and social sensitivity demands support of sustainable production and environmental quality over time.

At the European level, there is hardly any production of Tilapia but instead it is imported from China amounting to about 20,000 tons annually, it is imported frozen whole and filleted and the countries shown in the table below are the biggest consumers in Europe.



3.2. - Legal and administrative framework

To install a fish farm in Spain it must comply with the requirements of the Autonomous Community, the Hydrographic Confederation, the city etc.

Within these requirements and in the case of an alien species, all autonomous communities all require a process of environmental impact assessment or at least an environmental report, to ensure that it is going to perform under extreme environmental security, that is, ensuring that farmed fish do not escape to open water or if they did, it would not be possible for them to survive. In principle, the low tolerance to low temperatures found in the specific environment, should ensure environmental safety, yet it is advisable that cultivation is carried out in a closed circuit which ensures that every product leaving the plant, as in the processes BREEN ago and can be seen in Annex 1 document, application of exotic species.

3.3. - Possible interactions with other interests

Although requiring a prior environmental report for our facilities demonstrates that there will be interactions with other interests such as farms and ranches, the conditions of the environment to tourism resources etc. experience shows that there are sometimes appear social prejudices that hinder the installation or operation of conventional farms. BREEN systems are not governed by the same production concepts that traditional farms, giving special emphasis on sustainability and respect for the environment so that the wastewater discharged from a BREEN fish farming has no effect on the quality of other water in the environment.

The interaction between fish crops like those of BREEN and other interests have been revised throughout the process of the pilot, demonstrating a positive relationship.

3.4. - Tilapia farming in Spain

3.4.1. - Existing holdings

Nationally there is no large production of Tilapia that can provide solutions to the existing demand. According to the data collected by Infofish at its annual congress of 2010, the amount of Tilapia currently imported from China to Europe is approximately 20,000 tonnes, of which 4% are for the Spanish market and 22% for the French market

The Valencian company Puçol Aquaculture produces approximately 20 tons of Tilapia and the Southern Company in Adamuz produces about 100 tons annually. All this production is consumed in local markets and is not enough to supply the current demand of around 800 tons per year as shown in the graphs above.

3.4.2. - Potential

As mentioned earlier, in Spain Tilapia farming is still very underdeveloped. Consequently, it is a fish that is virtually unknown. Despite this, the pilot carried out with these fish, including BREEN, are generating interest, which suggests that its introduction in the Spanish market can be very positive.

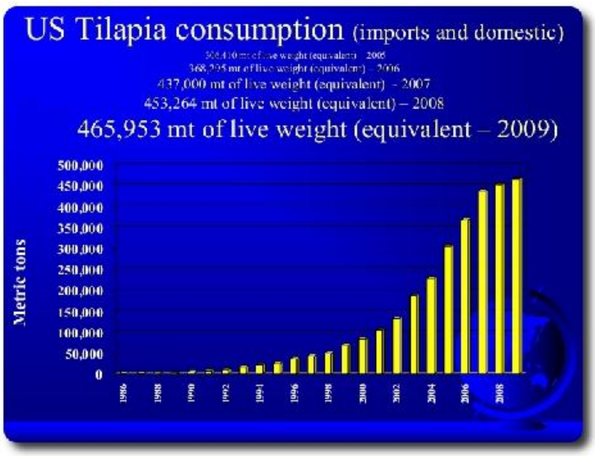
The great demand for fish in our country is an advantage over other less traditional markets with this type of products. In any case, the emergence of a new species, or a little known species, always has to overcome some initial reluctance, which in this case is due to that there may not be a morphological similarity with other products that are well accepted.

Tilapia is known by the same common name worldwide. This represents a great advantage for marketing. Possibly most consumers do not know the Spanish fish Tilapia but it is one of the most consumed fish in South America, Africa and Asia, so that the immigrant population is well aware of this fish and it is in this core market where there is greater acceptance.

The marketing of Tilapia can be done two ways, like bream and sea bass with a known size ration or cleaned, sliced and packaged in trays for easy handling in the kitchen.

Being a white fish with a neutral taste and spineless, it is ideal for consumption by children and adolescents in various formats. As fish sticks, in sausages, as hamburger and so on.

In the U.S. there is an emerging market of the products of the 4th and 5th category range in the format "open and ready", two minutes and ready to microwave. No messy, no odor and with many different possibilities and sauces. As seen in the table, in the last 10 years in the U.S. there has been a 500% growth in consumption of Tilapia with these new formats.



3.5. - Marketplace

Among the features that make a product like tilapia appealing for consumption are appearance, meat quality and high nutritional value, low calories and no cholesterol.

However, only in recent years have Tilapia products begun to emerge and be recognized. This increase in production was mainly due to a strong U.S. market, which has emerged as one of the largest importers of Tilapia. Currently the market is split into several segments: live fish, whole frozen fish, frozen and fresh fillet steak.

South America is the source of most of the imports, followed by China, Taiwan, Indonesia etc. Moreover, the Canadian market has experienced a large increase in recent years, as well as the live fish market in South America receiving Tilapia and Jamaica.

In South America there has also been a growth in consumption in Tilapia so Colombia, Venezuela, Brazil, Mexico and Cuba as well as being exporters, have a strong local consumption.

The Arab countries are likewise an important market for Tilapia, consuming high volumes from both imports and domestic production. The largest producer in the area with 384,000 tons is produced by Egypt. Similarly, major importers of Tilapia from Asian countries are Saudi Arabia, Kuwait, UAE, Bahrain, Jordan and Qatar.

In Europe this product is still largely unknown to most people and its culture is in its infancy, but promises a rapid growth and a promising future. The country with the largest market for Tilapia is the UK with 34% of imports, followed by France 22%, Germany 17%, Belgium 14%, Portugal and Spain 7% and 4% respectively.

The main consumers of Tilapia in Europe are people from Africa, Asia and especially China living in major European cities, although its consumption is growing exponentially in markets where the presence of these communities alone will not be the reason for this increase.

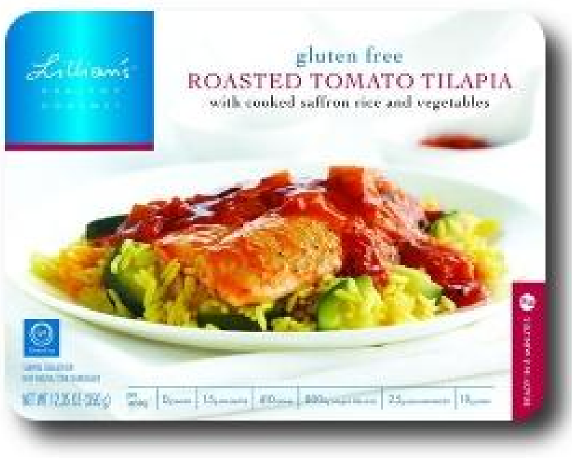
Virtually all of the Tilapia consumed in Europe is imported, until recent years, only Belgium produced Tilapia, having become the second largest product of aquaculture in the country. At present, the UK and France already own productions and other countries have undertaken several pilot projects.

Unlike the U.S., the European market prefers imported and frozen whole tilapia. The main suppliers for Europe are China, Thailand, Indonesia, Vietnam, Malaysia, Costa Rica, Jamaica and more recently Zimbabwe and Uganda.

In the international market, the final weight of the fish varies with the specific demand of the market, the optimal size being between 600-800 grams.

The future of Tilapia in the international market is very encouraging. The U.S. and Europe are experiencing a decline in beef consumption, thereby increasing alternative sources of animal protein such as pork products, poultry and aquacultural products.

Given the bright future of this activity, it would be beneficial for companies producing Tilapia to expand product presentations to provide a greater market to supply the current demand as is being done in the U.S.



Products include a large spectrum of possibilities of preparations like sausages, smoked products, sashimi, breaded products, marinated products, surimi etc.

Since, as discussed above, Tilapia has a shorter reproductive cycle than most commonly farmed fish and it is very resistant to diseases and environmental conditions, the real difficulty lies in the cultivation at a certain scale and the need to identifying professionals with studies in aquaculture products, good management and extensive experience in its farming.

The major importers of tilapia are the U.S. market and to a lesser extent some European countries being supplied by Asian and South American countries.

Serious health problems have been suffered lately by cattle and pigs (BSE, swine fever, avian flu etc.) And traditional fishing practices that have resulted in some cases unsustainable, have led to the drastic reduction of fish stocks and have led to the opening of the doors to aquaculture products to a huge potential market for which there is not a structure that ensures stable production of supply.

In the European market, until recently, demand for Tilapia was often limited to specific ethnic groups and the species was not familiar in large markets. But gradually, Tilapia has begun to receiving more attention, while consumers are showing that there is good potential in the European market for the replacement of many species of white meat. For all these reasons, Tilapia at a good size and quality could be very well accepted by this new market.

Access to the sector of the international market of Tilapia is through developing a thorough business plan, in which the following factors properly sequenced must be considered:

- Determine the market eligibility.
- Research the product price in the destination market and compare it to the cost of production, transportation and marketing of fish in the presentation format chosen. Analyze whether it is in the international market in France because of its proximity and market share previously explained.
- Having a quality control plan to show the consumer.
- Investigate health certificates required.
- Ensure that the packaging, labelling and the rest of the product meets the general standards of health agencies and food security. Contact local authorities.
- Develop a product specification sheet that contains complete information about the product.
- Check with freight forwarders and transportation prices, transport routes and tariffs.
- Prepare a price list once all of this is covered that will include all ítems.
- Ensure that you know the times for the release of the order, under its own brand name.
- Meet monthly or weekly capacity of fish that can be offered to the buyer and ensure continuity of supply.
- Select the best buyer for your needs and skills: dealer.
- Send specifications, prices, and potential customer samples.

3.6. - Production

As discussed, Tilapia farming has been carried out mainly in developing countries, it is based on the remarkable adaptability of the species and subject to the existence of a warm climate. The socio-economic framework of these countries has led to the use of rudimentary farming techniques, with the application of basic systems and minimal control of the process, the end result is usually a very relevant production and a mediocre product as having as the main consideration the low production cost. The relatively significant expense of installation and operation of modern systems is undoubtedly an impediment since we tried to reduce these at BREEN by utilizing sustainable management of energy consumption in terms of heat and power systems through Efficiency and Renewable Energy Renewable.

Thus, the most developed technology available to compensate any adverse climatic conditions for the species, with modern infrastructure and systems capable of providing highly productive crops. The control of these facilities yields a high and accurate product quality although the cost may become slightly greater.

The project's objective is to analyze the feasibility for BREEN to achieve a sustainable product of Tilapia in places where the temperature is not appropriate, in competitive conditions. This involves combining the advantages of adaptability and simplicity of processes with the implementation of quality control to ensure the achievement of a good quality product at a reasonable price.

To achieve this goal it is necessary to incorporate sustainable technology that optimizes production costs and increase revenue, which means establishing strict control over:

- The farm, ensuring an excellent genetic line, with regular and sustained harvests
- The processing plant, using expected returns and meeting the requirements of health and hygiene in the handling, processing, packaging and cold chain
- Marketing in every way, from the output of the product, transportation to mass marketing (monitoring and control of traceability)
- Conservation of environmental quality of the environment through the application of preventive measures and control procedures sufficiently rigorous and economically sustainable
- Quality assurance to the consumer through the adoption of the standards required by the European Community, which also recommend the implementation of ISO 9002 quality certification, and certificates of environmental quality, EMAS, ISO 14000 certification. It would also be of great interest to have the GAA registration, Global Aquaculture Alliance, a non-governmental international organization designed to support the practice of aquaculture and organizations in harmony with the environment.

3.7. - Processing Plants

When market demand requires significant production volumes a processing plants of high technology are needed, automated systems equipped with cooling to process the fish immediately after harvest in order to reach the finish and packing plant.

A processing plant must comply with national regulations and international guidelines for food safety and standards of the European Union. For best market competitiveness it is also important to meet other international codes: HACCP Certification (certification system hazard analysis and critical control points), ISO 14000 environmental certification etc.

One of the decisive factors for maintaining quality standards is temperature control. Analysis in this section serves to highlight the importance of maximizing every aspect related to the human culture as in processing farm plan.

To refrigerate or freeze the product effectively, either whole or in fillets, requires a good cooling equipment.

In order to ensure the preservation of the fresh product until it reaches the consumer, it must be maintained at all times at temperatures close to 0 ° C, from the moment of harvest. This prevents the initiation of enzymatic degradation that would result in a poor quality of the fish. To this end it would be advantageous if the processing plant was as close as possible to the production itself, so they could be processed and packaged as soon as possible, avoiding the aforementioned catabolic processes of oxidation and dehydration.

Should frozen fish be marketed, it is essential that the process is faster, to relatively slow down the crystallization temperature which causes water in the tissues, which involves the destruction of its structure, which in turn results in a loss additional weight. This is usually what happens when using Freon, a gas it is slowly freezing and high temperatures. The minimum holding temperature should be between -23 and -29 ° C, as it prevents these processes, maintaining the physical and chemical basis of the product, and thus preserves all the organoleptic characteristics associated with freshness and flavour of tilapia.

For these early results, the best method is to cool the product with nitrogen or ammonia for one hour at most, since the crystals formed are small, causing minimum damage to the tissue.
Taking into consideration the above, it will lead to the conclusion that the higher efficiency, higher production and lower costs, will allow competition in markets with a high quality and affordability.

3.8. - Product Quality

When undertaking the introduction and promotion of a species in a new market, presentation and product quality are of paramount importance, since its properties and culinary values are the main aspects to be promoted. This implies a rigorous control at all stages of product processing and marketing. One aspect to consider is the size of the fish to market. The individual weight at harvest time should be between 600-700 grams, optimum size for delivery of product in its most common state (whole gutted or filleted). Notably, in this sense, the weight loss in being gutted and head is 12%, while for cleaned, filleted and skinned is between 60 and 65%.

In reference to its organoleptic properties, it must be ensured that the meat aromas or flavors lacking exogenous moreover crops frequently lacking in quality control in the water. To make this happen, immediate corrective measures must be taken, such as subjecting them to continuous streams or aeration until they get the aroma and mild taste characteristic of Tilapia.

Because of the features appreciated in Tilapia meat are its white meat, firm, juicy, smooth texture and slightly sweet, this species has earned a place in the market because of its high nutritional value, low calories and absence of cholesterol. Thus, average values for these parameters are of meat yield of 100 grams: 19.6 grams of protein, 172 grams of calories and lipids 1.29.

The attributes of their steaks, their texture and flavour make Tilapia is equitable with species as prized as sole or grouper, so we can say that it is a high quality fish.

Approximate values per 100 grams of the edible portion of fresh Tilapia:

Immediate Principles	**Unit**	**Value**
Calories	Calories	96
Fat calories	Calories	22
Total fat	Grams	2,2
Saturated fat	Grams	0,4
Cholesterol	miligrams	48,2
Sodium	miligrams	52,6
Carbohydrates	Grams	0,9
Protein	Grams	18,4
Vitamin A (retinol)	R.D.A. *	1,8%

Calcium	R.D.A.	5,3%
Iron	R.D.A.	1,8%
*R.D.A. Recommended Daily Amount		

Another important aspect to consider regarding product quality is the labelling. Since January 2002, the European Commission requirements for aquaculture products should contain a label with the trade name of the species, area and type of water where the species was cultivated.

3.9. - Marketable by-products

Once at the stage of processing the fish, depending on the presentation to be obtained for marketing, various products can be generated from Tilapia. If the product is whole, the by-products are obviously nonexistent. However if in processing removes the head, gills, viscera, scales and spines, these residues may serve to prepare feeds and fish oils. These can be destined for feeding carnivorous fish, getting a sustainable food product currently is not.

In this sense, the recent regulation on the production of feed, following the outbreak of bovine spongiform encephalopathy (BSE) also known as mad cow disease, has led to dramatically increased consumption of fish meal as a substitute for the above.

If the submission is in fillets, tilapia cuts cause large amount of product in trimmings. These trimmings can be exploited in the development other products such as sausages, smoked goods, breaded goods, marinated goods, surimi, broths, extracts etc.

On the other hand, they could be included in the preparation of food products for fast food, frozen and precooked 4th and 5th generation, in high demand in the market by virtue of changes in lifestyle and consumption in Spanish society.

Note the enormous importance of one of the preparations cited: surimi, which mimics the shape, taste and texture of products such as crabs, lobsters and eels.

Among the products sold with fish, burgers are acquiring an increasingly important role.

The restaurant chain McDonald's in its quality and sustainability strategy is introducing Tilapia in its new options fish products.

Considering all the above, there would need to be further study to develop new products processed from tilapia.

3.10. - Marketing and distribution

Being a fairly new species in the Spanish market, the marketing of Tilapia must meet certain requirements to settle and ensure sustainability in the production conditions:

- Product availability throughout the year to ensure consumer demand.
- Obtain a product of a high quality image.
- Attractive appearance, firm white meat, boneless fillet.
- A good image of the product in the worldwide market for local markets.
- Promotion of aquaculture products and especially Tilapia.
- Commercial work to raise awareness of the product to consumers.

As a basic criterion in the development of image campaigns this product should be treated under a single brand name. At this time, still only anecdotal volumes are marketed in Spain, so when naming Tilapia, bravia or Nile perch, a name that should correspond to a markedly different kind.

For this product, like any other, do not forget that the market is controlled by the consumer trends and demand, so you should aim to respond to their demand, pursuing qualitative and quantitative satisfaction as the final objective. However, it should be noted that consumers tend to act influenced by inertia (custom, tradition etc.), influenced by marketing itself, which is the essence of this sector.

To market a product it needs to be analyzed, including all members of the chain, production, distribution and sale. Thus, the distribution of Tilapia is a complex chain composed of various business processes and services, which include packaging, processors and distributors.

One of the major problems national tilapia producers face is fierce competition caused by current producers in Asian countries like China and Taiwan, who have spent several years on the market and have more experience and competitive prices. A market sector which is more accessible to local producers could be fresh tilapia or even live fish.

4. - Market strategies and public acceptance

In recent decades, the fishing industry has experienced a sharp decline due to reductions in the availability of traditional species. As a result, aquaculture is currently a very competitive alternative to capture fisheries and aquaculture product availability has increased in response to increasing demand. Nearly half of aquaculture products consumed worldwide are supplied by aquaculture and the increased availability of aquaculture products at competitive prices has dramatically increased the consumption rates.

These circumstances favor the Tilapia market and it is experiencing tremendous growth in several countries like the U.S. and now it is one of the most produced fish because of its nutritional properties and its easy adaptation to intensive production systems.

With all this, the main objectives for the introduction of Tilapia to be a success are:

- Fish at competitive nationally and internationally prices.
- Getting simple low-cost effectively.
- Development of technology
- Energy Efficiency in power consumption, thermal management, sustainable water management, food and personal care, appropriate to achieve a kind of sustainable aquaculture.
- Export and integration into the family economy.
- Plants for their simplicity can be handled with ease and settle within farms and ranches operating in current family regime, disused farmhouses etc.

The tendency of consumption habits shows an emphasis on quality over quantity and preference for natural, organic, ecological and sustainable products.

Some of the proposals that generate greater consumer agreement are:

- It is increasingly important that containers that are recyclable.
- The quick release imposed on the market.
- The label information is important for consumer products.
- The global purchasing big supermarkets are reaching great importance.
- Food purchases will be made more widely spaced in time.
- There is a trend towards global purchasing outlets with image quality.

This power model, chaired by culture dishes prepared and freeze / thaw sheds revealing data:

- 71% of households use frozen food for themselves and 59% of households use purchased frozen unprepared food.
- 40% of households use frozen ready to eat, while 36% of households use not ready to eat frozen.
- 17% of households already prepared a dish called and 16% of households were to pick a dish already prepared.

4.1. - Product Presentation

One of the most important parts of marketing is the presentation of the processed product. The presentation will depend on the market to which access and the frequency and volume of production. In addition, in areas where temperatures permit or technical conditions realizable, you can achieve a constant input of fresh fish into the market.

The supply of fresh or frozen fish depends on the means of transport and distances to reach the end customers.

4.2. - Types of submission of the Tilapia

- Fresh or frozen whole in several formats: Yet
- If viscera: Headed and gutted
- Fresh or frozen fillets: whole fillet
- Court V
- Tilapia alive

4.3. - Technical difficulties and risks

Tilapia production like any other fish is expensive, requires technology, proper handling, experience, permanent genetic selection, high quality breeding, supplementary feeding and protection. New technologies are helpful to producers because they produce more at lower cost with high quality, but should have a full system of monitoring and controlling the technical and financial aspects for a competitive product with other domestic and international supply.

We must pay particular attention to the risk involved in relying on imports of Tilapia fry as they can carry a number of diseases from Israel and some from Asian countries.

Therefore BREEN farming systems have their own hatchery to control playback and players are renewed periodically and brought from FishGen facilities in Wales after undergoing some quality control standards and hygiene.

4.4. - Continuous Improvement Plan

As discussed above, the development of a marketing plan based on detailed knowledge of the production and the characteristics of the target market are key to the success of such an initiative. However, the effort should not be only in this area, but must undertake the monitoring of orderly production and financial systems, identifying weaknesses and fixing them in time using an analytical mechanism that allows feedback of results to improve those negative aspects that may compromise the success of the experience in a means of continuous improvement.

The most common method is called SWOT analysis or weaknesses, threats, strengths and opportunities, whose initials are named.

An example of SWOT analysis applied to the marketing of tilapia generically could be:

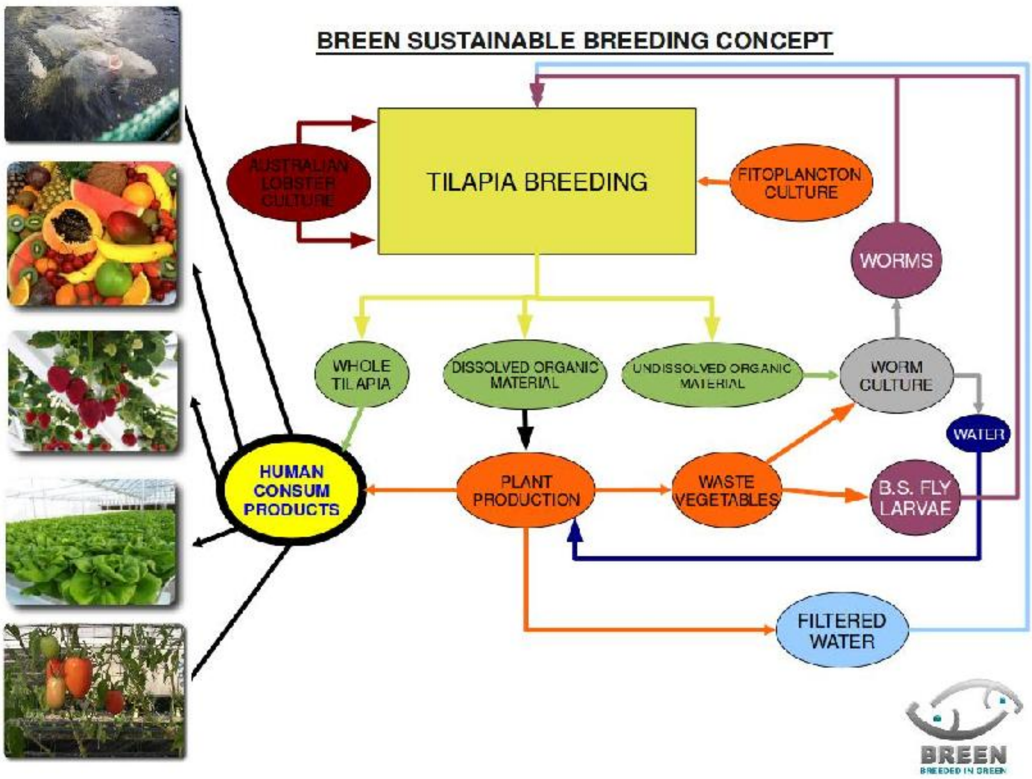
WEAKNESSES	**THREATS**
This is a new species. No distribution channels Higher advertising expenditures	Competition similar products This is an unknown species Open market may take
STRENGTHS	**OPPORTUNITIES**
High product quality Strict quality control Product ecological, organic and sustainable High growth rate Competitive price Highly nutritious Food security Easily marketed to	foreign population as the species known in their home country Great potential Susceptible to transformation Ideal for school canteens Employment development of fast food

5. - BREEN culture methodology

In the pilot test used at BREEN, fibreglass tanks have been used of different sizes for hatchery and fattening. In total, for mass production as done, 15 tanks are used as shown in the image.

The sustainable intensive farming system at BREEN for Tilapia is based on the automation of production processes.

Main diagram of a system BREEN Tilapia culture in Aquaponics

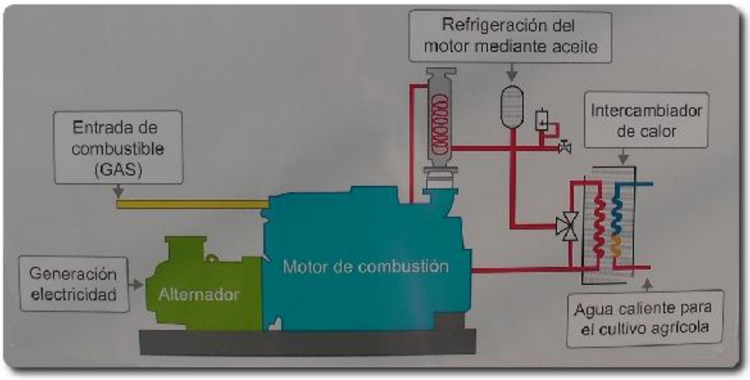


5.1. - Thermal management of water

A key to the system is the automated control of the temperature of the tanks.

The heat is obtained by a mini cogeneration plant. Cogeneration is the production of electricity from gas combustion (this time). The use of this combustion gas is approximately 40% while the rest of the energy is dissipated into heat. This heat generated by combustion of the gas engines make heated electricity generators.

To cool these motors, hydraulic systems are used which pass through the body of the engine, absorbing the heat from the engine. That hot oil, often around 100 ° C is passed through a heat exchanger for oil-water to cool the oil and can be passed back by the motor, repeating the cycle of cooling. The resulting hot oil-water heat exchanger is stored in a tank, which is subsequently used in the heating of the water in the tanks through a wall heating system. The water exiting the heat exchanger can be up to 80 ° C at times of maximum engine use.



Using a self-priming pump, controlled by a thermostat, the water is pumped from the hot water tank to the BREEN facilities.

Self-priming pump

The primary heating system is comprised by a thermostat that is programmed between 30 and 40 ° C.

When the system detects that the water temperature of 300 litres of the primary system is below 30 ° C, the self-priming pump starts circulating the water from the hot water tank and stays on until the water inside the fish tanks reach 40 ° C.

This water is circulated through the heating pump to the internal wall heating system of the tanks.

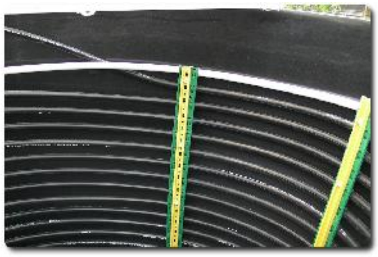
Primary heating system 300 liters

As a result, the water in the tanks is in continuous contact with the pipe wall heating system by radiant heat exchange and is maintained at the desired temperature for Tilapia.

Each of the tanks, as seen in the images, has a wall heating system in the inlet and thereof has a solenoid valve which allows the hot water to circulate inside the tank. This solenoid valve is controlled by a thermostat and is programmed within the optimum temperature values for cultivation. For BREEN, between 24-28 ° C.

The heated water from the system and the water in the tanks do not mix at any time, so as to avoid any contamination.

Thermostat

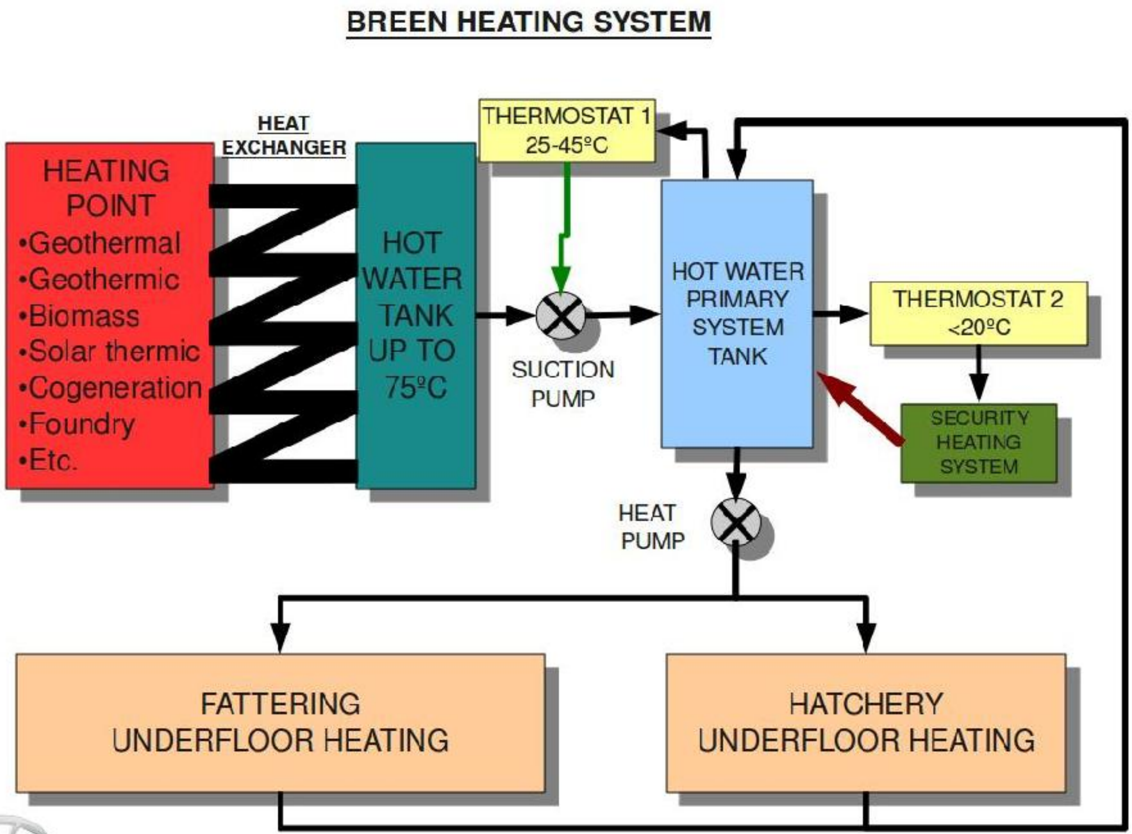


Inside of the tank

Solenoid valve

Heating pump

General scheme of a thermal management system BREEN

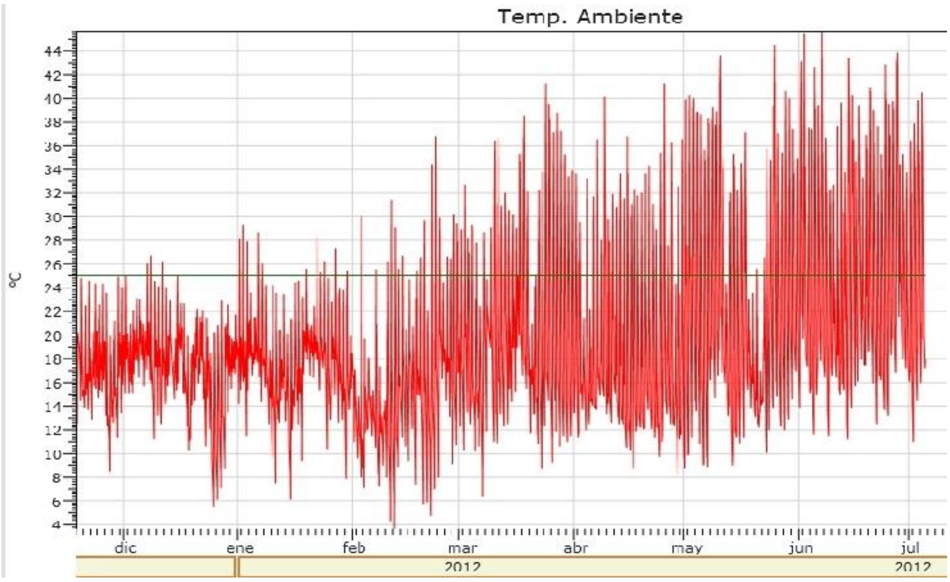


5.1.1. - History temperatures during the pilot test BREEN

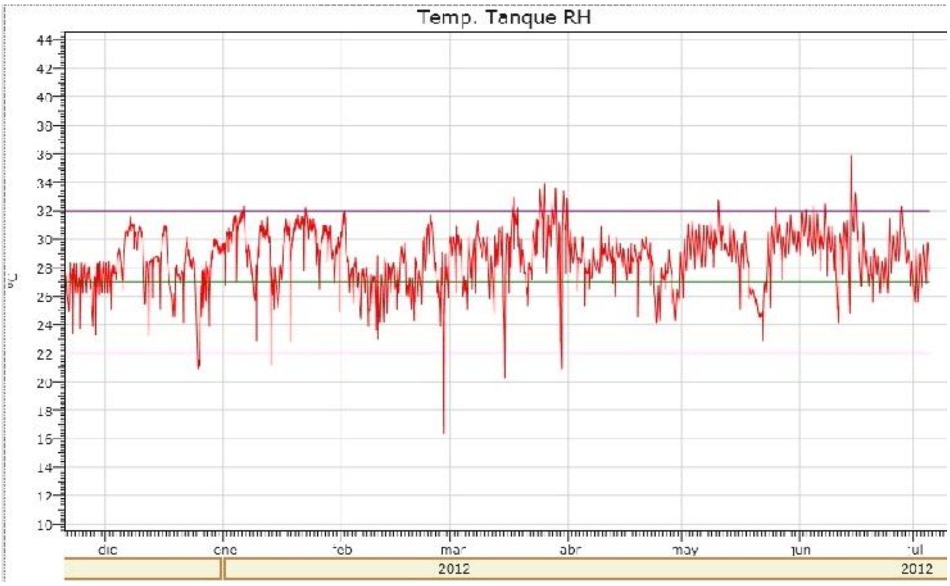
Throughout the pilot, using the NTP logs daily and probes were generated of temperatures of the tanks, and environmental recirculation so that you could see the impact of outside temperature on heat loss of each of the tanks and the heat requirements generated by this loss.

This data was then graphed, tracking each feeder tanks, recirculation hatchery and temperature in relation to the greenhouse environment.

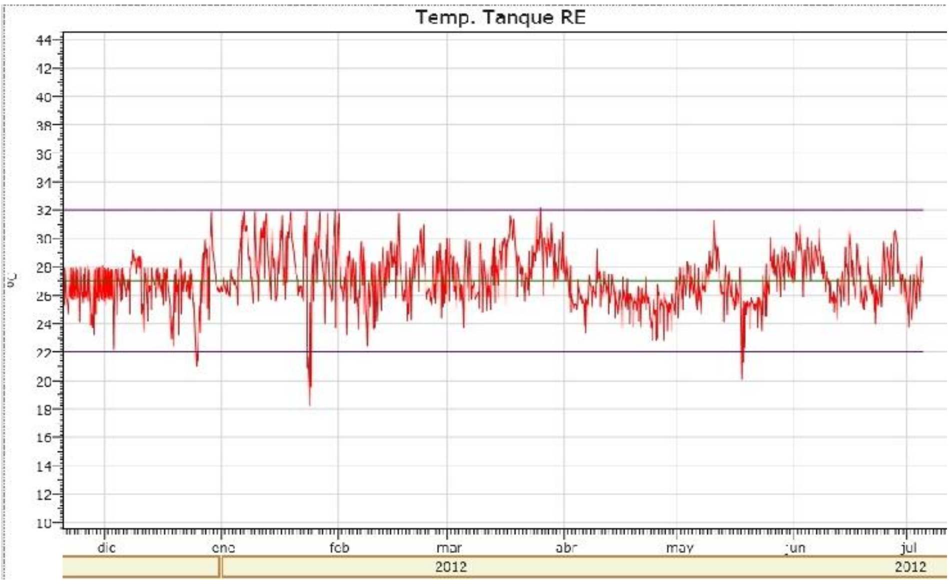
Ambient temperature



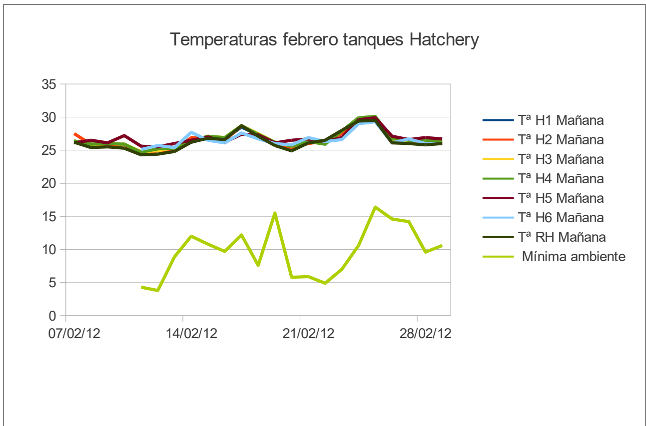
Hatchery recirculation tank

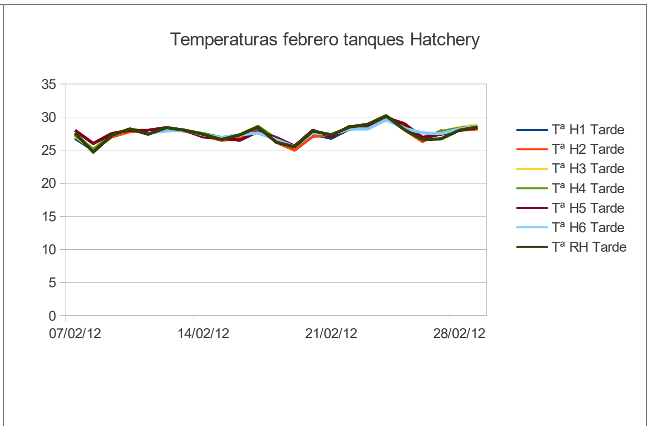


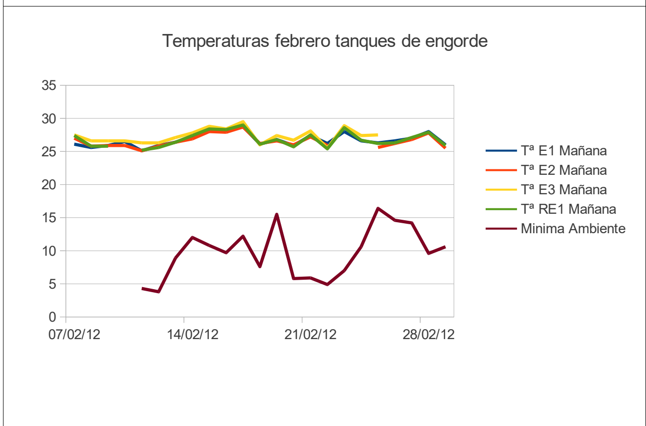
Fattening recirculation tank

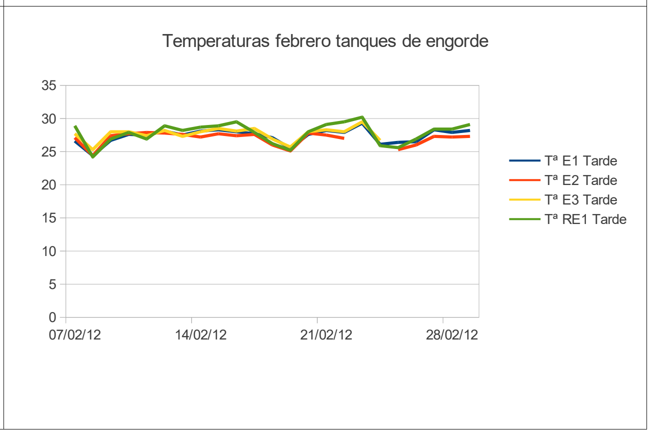


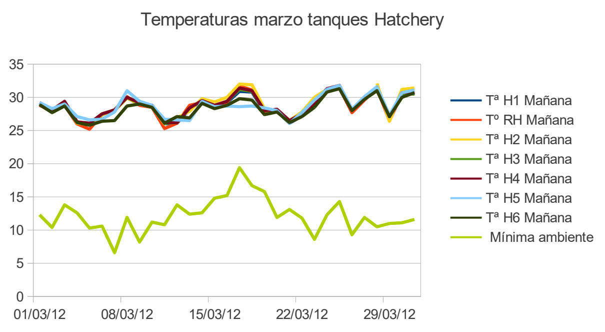
5.1.2. - Effect of temperature on the temperature of cultivation tanks







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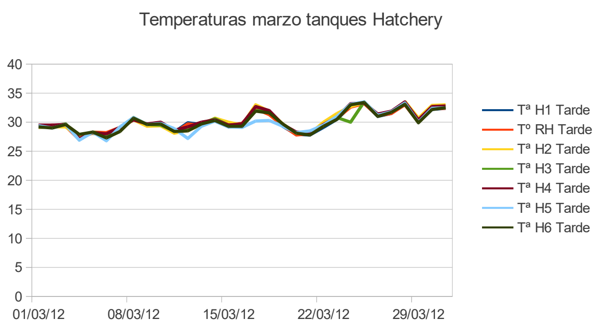
Tª H5 Mañana
Tª H6 Mañana
Mínima ambiente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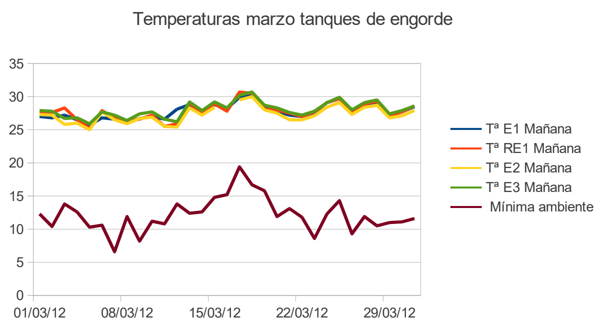
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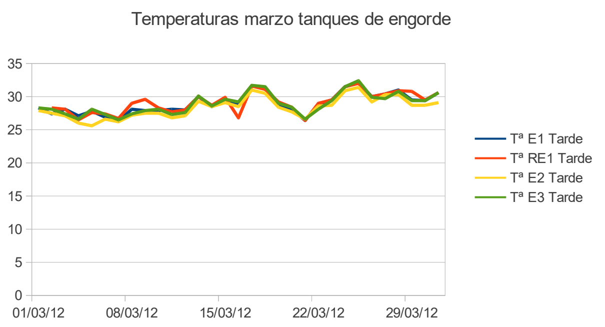
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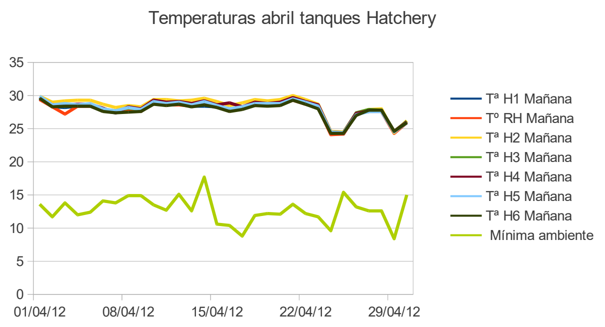
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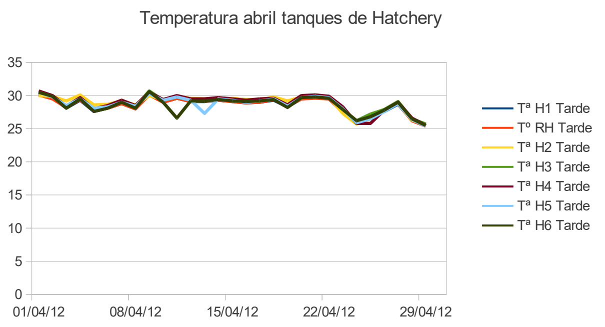
Mínima ambiente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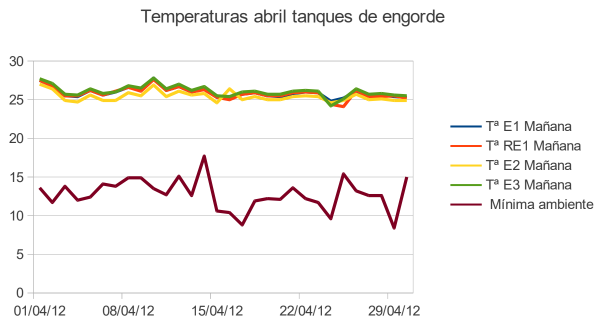
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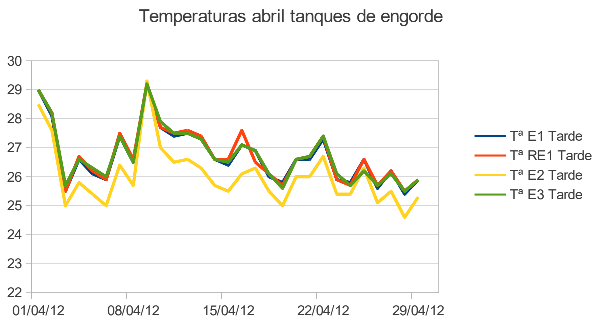
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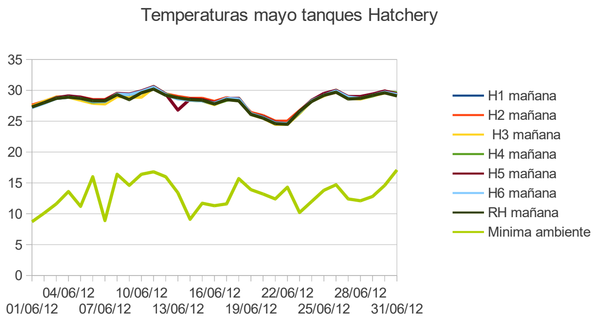
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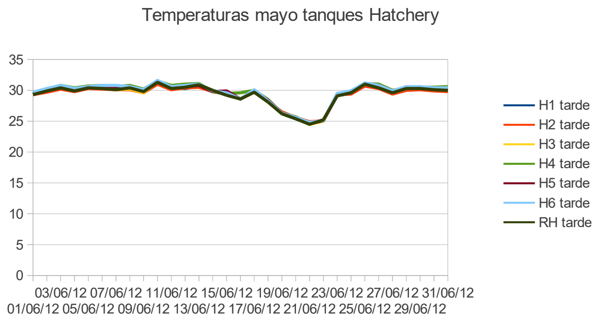
Minima ambiente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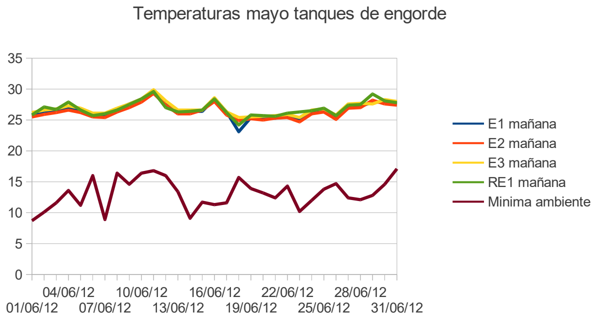
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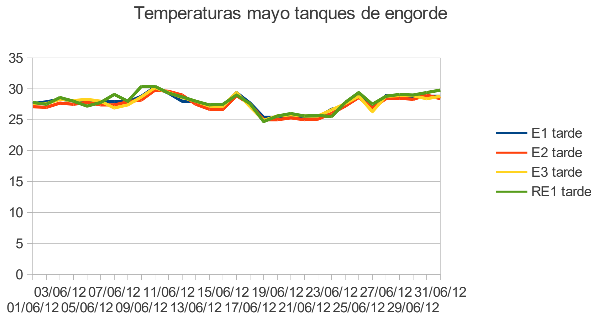
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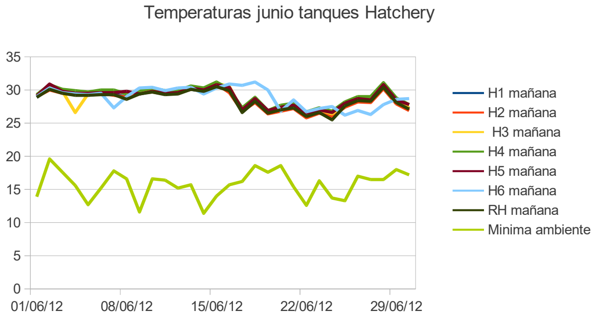
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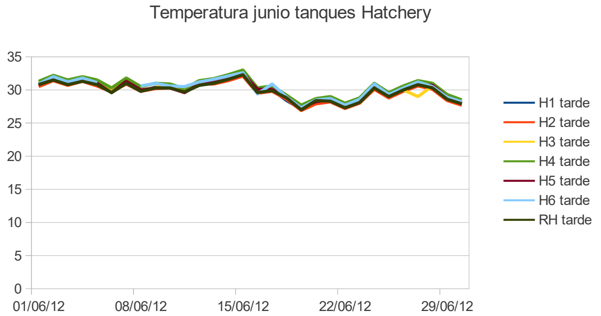
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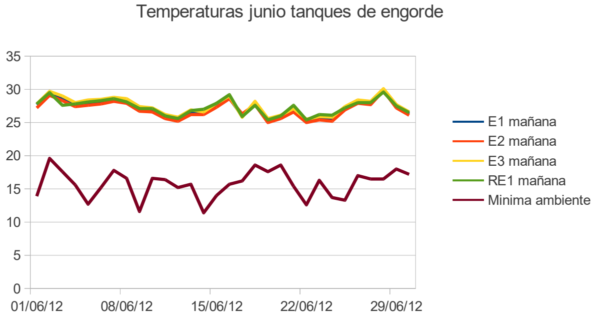
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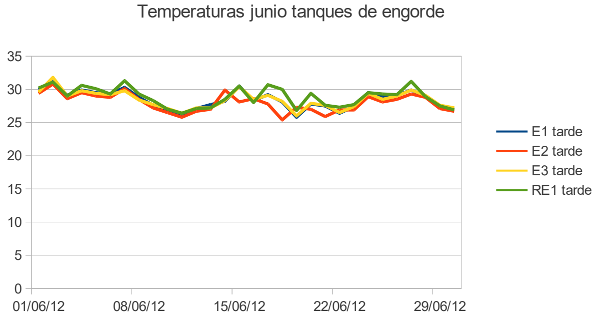
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5.2. - Intensive farming of tilapia in recirculation

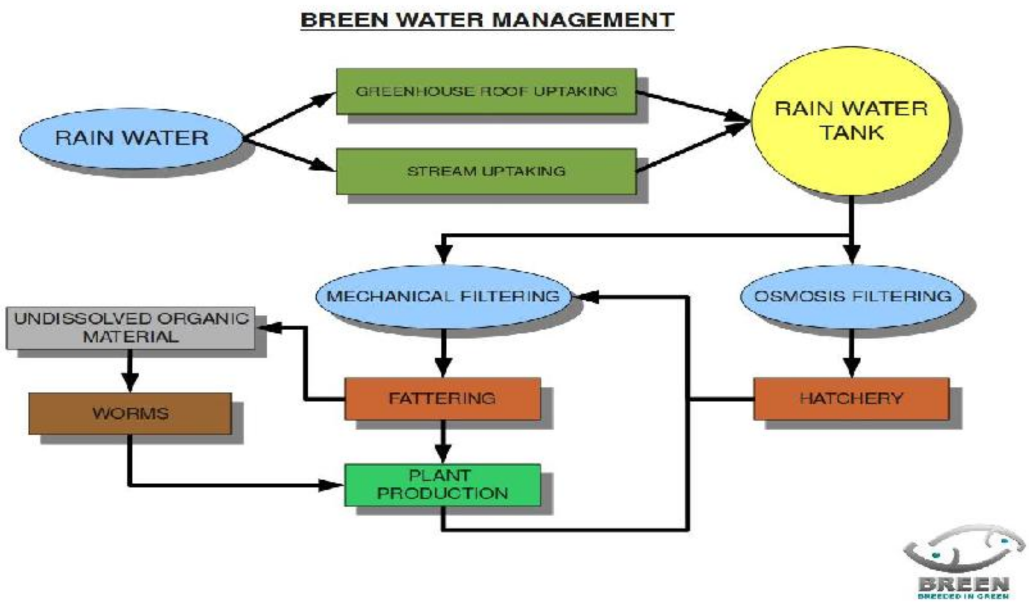
For intensive farming of tilapia in recirculation tanks fiberglass was used as mentioned in the previous chapter.

In this circuit the reuse of water is continuous, for which the system has multiple pumps and filters that allow recirculation and cleaning the water of undissolved solids. In BREEN systems water use is fundamental. Only 20% of the water of the total volume of the system is changed weekly. The main reason for the need of outside water is due to evaporation and the filtration plant that will be discussed below.

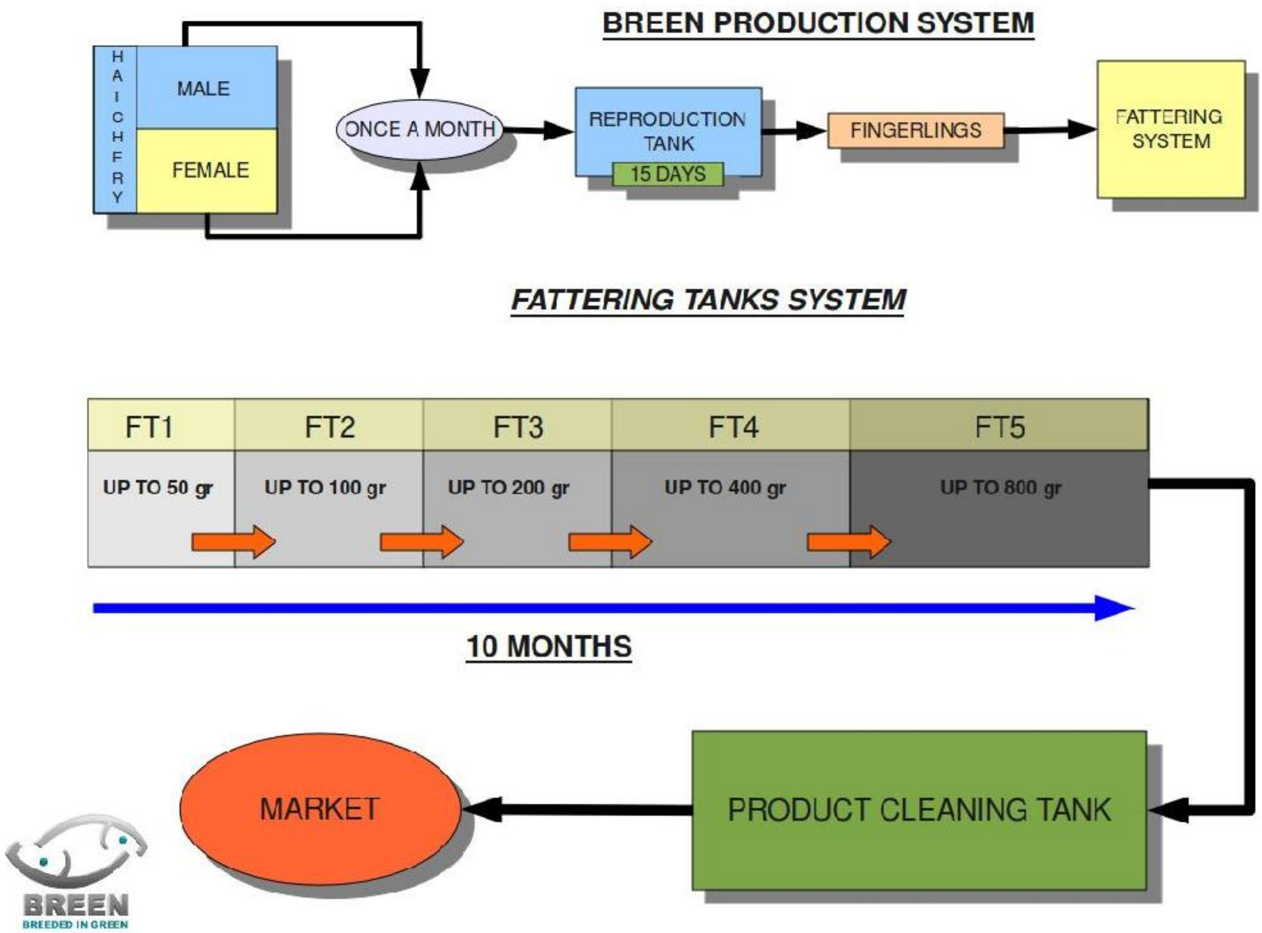
To ensure the sustainable management of water, it is necessary to take advantage as often as possible of open systems of aquaculture crops after using the water for irrigation in soil for cultivation, discarded and introduce the new water 100% outside.

Water is a scarce commodity in many parts of the world so it is important for sustainable management of the same. Furthermore, it is necessary to have plenty of water in any location of aquaculture farming conditions the crop to a great source of water such as lakes, rivers and the sea. By BREEN sustainable culture system is recycled up to 80% of total water so as to eliminate the aforementioned geographic limitations.

The BREEN pilot was carried out using only rainwater. The total farming volume was 30m^3 and renewal of approximately 500 liters / day. This amount of external water renewal is below 20% but must be kept in mind that during the greater part of the pilot crop biomass was below 60% of the total.



The biomass is calculated relative to the water capacity of the tank volume and characteristics of the species. In our case, Tilapia has great adaptability to intensive farming in recirculation and supports large amounts of biomass per m3. Initially, because of the philosophy of BREEN organic farming, sustainable biological a calculation is made to work with Tilapia biomass of 50kg/m^3. This results in production research and development of the crops of approximately 200-250 kg fish per month, taking into account that the size of each fish is about 600-700 grams.



5.3. - Food

Tilapia has omnivorous / herbivorous eating habits, so small aquatic insects can be part of thier diet, detritus and bottom sediments of silt even bacteria.

It is also capable of reingesting stool under scarcity of food.

Accordingly, the present Tilapia structural adaptations to these diets are a very long folding intestine, etc. Specific teeth.

Until relatively recently feed used for growing Tilapia contained animal protein levels above 40%, which was considered necessary because the high concentration of animal protein.

For the farming of Tilapia in the BREEN project a specific food BREEN was created and produced that is 100% vegetable. This food, manufactured by DIBAQ contains only vegetable protein, soybeans, rice, wheat etc. Here you can see the comparison of the traditional food used containing fish meal and oil.

Alimento Actual		Alimento BREEN	
Materias primas	%	Materias primas	%
Harina de pescado	44	Trigo	25
Aceite de pescado	10	Arroz	22,9
Subproductos de cereales	34	Haba de Soja	15
Semillas oleaginosas	4	Harina de Colza	11,8
		Harina de Soja tostada	9,4
Carbonato de Calcio	5	Carbonato de Calcio	5
		Harina de Girasol	5
		Aceite Vegetal de Soja	3,6
Cloruro de Sodio	2	Cloruro de Sodio	2
Minerales	0,24	Minerales	0,24
Vitaminas	100mg/kg	Vitaminas	100mg/kg

As seen in the picture, the BREEN food does not contain flour or fish oils, it is 100% vegetable.

Tilapia are herbivorous / omnivorous and are perfectly fit for a 100% vegetable feed. During the pilot this has proven a correct adaptation to this diet for proper growth. Conversion factors are slightly higher compared to studies in the SustainAqua project in which I used 5-10% of fishmeal.
Within the BREEN production system, food plays a very important role. Feed containing fishmeals

are not sustainable. If you really intend to create ocean free aquaculture oce of pressure to catch those who have undergone in recent decades, it is not possible to continue using extractive origin fish from seas and lakes to produce feed for farmed fish. Currently in aquaculture to produce a kilo of carnivorous fish like salmon, it is necessary to capture at sea between 3 and 4 pounds of trash fish, this 4-1 ratio is unsustainable in the short term.

For this reason BREEN has put special emphasis on the cultivation of Tilapia and vegetable meals thereby breaking the dependency on marine catches. A BREEN Tilapia farming is a sustainable crop in the three areas mentioned above, water, energy and food.

5.4. - Food safety and traceability

At BREEN a very important point is the concept of sustainable food security. Currently captured fish have less and less food security. The fish caught is not known where they lived and ate.

Currently super carnivores are predators that are at the top of the food chain and contain elevated levels of heavy metals harmful for human health.

The Spanish Agency for Food Safety and Nutrition (AESAN) under the Ministry of Health recommends that pregnant women and children up to seven years do not consume these fish (tuna, bonito, swordfish etc) which are contaminated with mercury. 100 grams a week would exceed the tolerable intake of mercury in a pregnant, while children between 7 and 12 should not eat more than 50 grams per week.

The problem with these fish is that thanks to thier long life, they become heavy metal bioaccumulators. Mercury has ended up in the food chain of the seas without degradation from industrial waste in recent decades.

Also detected are high levels of cadmium in the heads of some species of crustaceans.

In addition to the increasingly urgent problem of the accumulation of heavy metals, fish may be contaminated with hydrocarbons that come from environmental disasters such as oil spills, sunken ships or oil rigs or simply caused by the combustion of petroleum products by the maritime traffic that exists today.

Parasitism in many fish species is also a problem that is detected in more species and in larger quantities. The parasite Anisakis is more widespread today. Apparently Anisakis is a parasite that can be found in the stomachs of some fish when fish is consumed raw or without having had less than -20 ° C for at least 48 hours, the parasite can pass to the human body and can cause dangerous allergies.

Farmed fish in recirculating systems on land may be exempt from all these food problems by following a strict quality controls in farming.

One of the important points in this regard is the control of Traceability of the cultivated species.

5.5. - Traceability

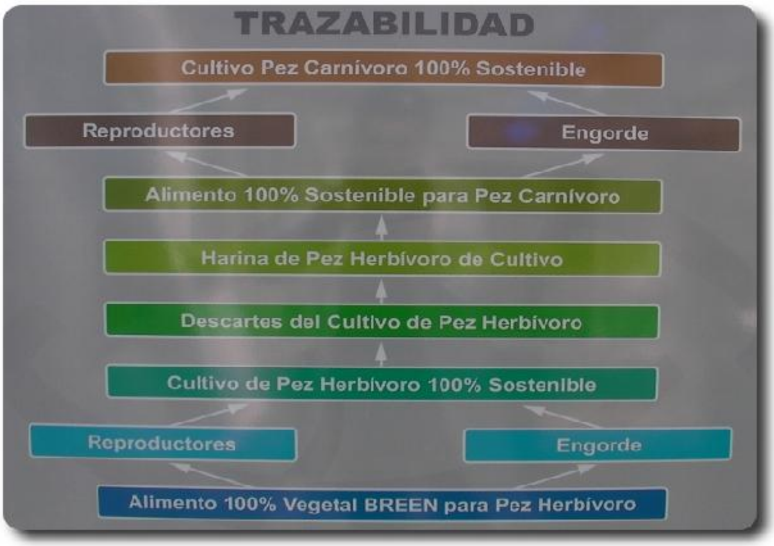
Traceability in fish farming is the possibility of having information at all times of the history and the fattening of the fish.

As mentioned above, the fish caught have poor traceability to the time of capture. From the time of capture it may not be know how it is maintained, when it was captured, and some capture location data are never known where the fish lived, fed, if it haas a disease or toxic levels are too high for consumption.

In a recirculating aquaculture system, traceability of the fish is much higher. Besides knowing the above statements to catch fish in a closed culture system data can be known as, how it has eaten while fattening, what type of food it ingested, what were the cultivation parameters, quality of the producer, etc.

Knowing all this data, thanks to the traceability of the production system, better food security levels are achieved than in captured fish.

In the system of traceability BREEN mentioned in crops closed circuit is achieved in two steps quality control, since it does not contain fishmeal this avoids the possible transfer of heavy metals or parasites of getting into the food chain of a product, so even greater food security is achieved as seen in the image.



5.6. - Automated Feed

Feeding tilapia in the pilot test was carried out in two different ways:

- *Manual*
- *Automatically*

Each feeder tank is dimensioned to hold a maximum biomass.
For a total of approximately 300 individuals from 650 grams in the larger tank and a concentration of 50kg/m^3. From these premises, fattening tanks are configured as follows:

E1 Tank: capacity 1200 litres. Maximum biomass 50-55 kg. Number approximately 325-335 individuals. Individuals between 100-150 grams. I think 2-3 mm grain size.
Tank E2: Capacity 2400 litres. Maximum biomass 100-110 kg. Number approximately 320-330 individuals. Individuals of 300-350 grams. I think 3-4 mm grain size.
Tank E3: Capacity 4000 litres. Maximum biomass 250 kg. Number approximately 310-320 individuals. Individuals of 550-650 grams. I think 4-5 mm grain size.

The control in the larval stage, incubator, and in the first phase of fattening tank H6, 1-100 grams fish, is performed manually to observe the correct adaptation to food. In the larval stage weaning is done with powdered feed with a lyophilized Spirulina intake by 20%.
Fattening tanks E1, E2 and E3 have an automatic feeding system controlled by a control system timer Profilux. The fish are fed daily with 10% of the total biomass of the tank in 3 or 4 divided doses depending on the size of the fish.

Automatic Feeder

5.7. - Growth

Tilapia is a relatively short-lived species, 4-7 years, and generally has rapid growth in terms of food and the environment in which it develops. Tilapia in intensive farming, reaches sexual maturity at about 4 months.

From the first year of life is when sexual dimorphism is more evident since males begin to grow faster and produce clearly superior sizes. In the picture you can see the difference between two fry born at a time but with a completely different growth rate.

5.8. - Pathologies

For success in Tilapia farms, like any other animal production, it is vital to be aware of the diseases that can affect the course of the life cycle of organisms or physicochemical conditions that promote their appearance and introduce procedures to prevent their occurrence or mitigate their effects.

Although tilapia has a remarkable natural resistance to disease, it is a life that is not without the risk of various diseases. Furthermore, the risk of getting various diseases increases with increasing the difference between the farming medium and the conditions of their natural habitat.

The most common impacts suffer are:

Infectious processes: handling suffered due to transfer processes between tanks, etc. may cause friction and skin wounds that can serve as a gateway to fungal and bacterial growth.

Kidney damage: water quality is often affected by various pollutants including pesticides and disinfectants that are commonly used in order to achieve greater efficiency in production, but to come into direct contact with the fish these can be absorbed through the skin, the gills or other external orifices.

Sometimes pathologies are revealed by an anomalous behaviour of the fish, reflecting the existence of some factor that affects the normal development. These behaviours can highlight abnormal lethargy and loss of appetite, loss of balance, grouping of fish in one area, rapid breathing, abnormal production of mucus etc. Also the presence of infections can be seen in the appearance of abnormal colouring, skin and eroded fins, gills and abdomen inflated and sprouted eyes.

Prevelent in Tilapia pathogens are opportunistic bacteria that proliferate when the fish are not in good condition, water quality is not adequate or there is a deficient diet. So, for example quintessential bacteria of the genus Streptococcus Tilapia are capable of causing mortalities of 10-15%.

There are other organisms that cause injuries and diseases such as protozoa, helminths, crustaceans, copepods, fungi and other bacteria.

Improper handling of specimens can also increase the presence and degree of involvement of pathogens so it is therefore necessary to moderate densities and sanitary precautions and perform preventive actions such as revise filtration systems to prevent high levels of ammonium and anoxic areas.

5.9. - Treatment

Prior to the start of any treatment it is necessary to identify the root cause of the disease to thereby apply the appropriate treatment in each case.

Factors to analyze this are, conditions of water quality, the farmed species and the age of the individuals treated. Moreover, once identified the possible cause and diagnosed of the disease, it is necessary to develop a series of studies relating to the chemicals used to determine the concentration of active ingredients, the tolerance of the species, the dose, the estimated time of treatment, synergies with other environmental factors etc.

The treatments can be applied by dipping external method, short or long dip bath and systemic injection, or biological treatment of sprayed medicine.

In the pilot test BREEN we have worked with Aloe Vera oil treatment for mucus regeneration and wound healing with full satisfaction

5.10. - Environmental Hazard crop

All human activity has an impact on the environment, just as it is influenced by various factors that shape it. The nature of the aquaculture industry, in both its production process characterized by the entrance and exit of water system materials and the peculiarity of being a management process of living organisms, is characterized by a set of environmental relationships, understood both in the sense of immediate and global environment.

The environmental impact is defined as the set of potential effects that the activity exerts on the environment compared to the environmental situation if it were not done. Thus, the impact on the socio-economic factor in this case is distinctly positive, in that it involves generating wealth, jobs, increase economic level, availability of quality food, etc. However, the natural environment is adversely affected to a greater or lesser extent. In the case of aquaculture, this impact is of little importance, provided a number of basic principles are applied.

Alterations on water resources: one of the possible changes that can be generated by the practice of aquaculture is the change in flow of water that constitutes the watershed, where the installation is located. In the case of the BREEN facility, the impact on water resources is minimal because by using recirculation systems it takes advantage up to 80% of the water already in use, needing only a contribution of 20% due to the backwash of the sand filters and evaporation of the water itself.

Water quality: The factor of water pollution that fish farming could generate in general and particularly Tilapia is basically represented by the discharge of dissolved organic matter and suspended solids. Such discharges lead to a decrease of the oxygen concentration of a microalgae bloom and turbidity in the water. In BREEN sustainable farming systems 100% of the dissolved organic matter and sludge generated in farming by filters and biological treatment is used.

In BREEN system, dirty water is not rich in organic matter. This organic matter can be found in the dissolved form in water or in undissolved form.

The main problems in a recirculation aquaculture farm coms when ammonium levels exceed cultivation ranges of the selected species, in this case the Tilapia. From 1.5 mg / liter of ammonium dissolved in water can be lethal to the farm. This is the main reason why the water is discarded and new water is introduced in a new cultivation, continuously in an open system. In a closed system or recirculation, water is reused several times before discarding as many times as the system is able to filter and purify it until you reach the optimum cultivation.

In BREEN we designed a complete filtration system that removes organic waste completely dissolved and undissolved organic matter.

As mentioned previously, the ammoniums are the main cause of the need for change of oxygen rich water etc.

The ammonium is generated by the fish themselves in their excretions, in thier respiratory system through the gills or simply by the decomposition of uneaten food.

In a BREEN system vegetable farming techniques are known to remove these ammoniums through aquaponics and water can be reused.

Aquaponic culture systems

The ammonium is harmful to fish but can serve as food for certain types of bacteria. The water from the fish tanks works as a bacterial culture and performs as a process of nitrification. Nitrification is carried out by a known bacteria Nitrosomonas and Nitrobacter first decomposing the ammonium to nitrite and then nitrate. Nitrates are harmful to fish but at much higher levels ammonium, in the case of Tilapia 50 mg / liter, also serve to perform aquaponic.

Aquaponic farming is a system of growing plants without soil and acts as a filter which removes nitrate from water by growing plants, vegetables, flowers etc. Nitrates are the main food of plants so that water from the fish farming aquaponic system remove nitrates in water, return it to the fish farm and vegetable production. This system allows use of up to 80% water.

Undissolved organic matter instead can not be absorbed by the filter plant so that it is treated differently. Undissolved feces, uneaten solid food, etc do not serve as food for plants and its accumulation in the sedimentation tanks or filters can become a problem for causing anoxic zones, sludge in a state of putrefaction and result in oxygen shortages.

Sand filters and drums serve to accumulate sludge so they can be removed. The main problem of this sludge is its high content of organic matter that can be a pollutant if discharged directly into the external water system.

Mechanical sand filter

Mechanical sand filter

In a BREEN sustainable farming system, untreated sludge is polluting matter, but is nutrient-rich organic matter that is used for other crops through biological treatment. A biological treatment system is a mixed culture of bacteria and worms stratified so that the sludge settles to the top of the filter, the worms that live in that area eat the sludge from the backwash from the sand filters and turn it into humus or compost. The compost material is storable, perishable in the long term long term, it can serve as fertilizer for crop plants on land and natural fertilizer and excess worms can serve as extra protein intake in Tilapia farming.

Worm culture

Worm culture

5.11. - Geographic Limitations for growing Tilapia with a BREEN sustainable system

The base of a tilapia farm is optimal control parameters.

One of the limiting factors when selecting a location for the venture is temperature. Tilapia farming requires a stable temperature throughout the year of about 25 ° C. Getting this temperature can be controlled in sunsets and make mass production as will be seen later.

The main producers of tilapia in the world are hot countries, with China being the largest producer by far.

In Europe, there are increasingly more Tilapia consumes but the limitation in the management of the water temperature is the difficult element and consecuently 95% of consumed Tilapia be imported.

With a BREEN farming system, the aim is to remove the barrier in Tilapia farming technology adding warm places. Through our system, we aim not to heat the water, that would raise costs and would affect the final price of the product, what has been developed in BREEN is a growing technology that adapts to an existing hot spot. You can find many hot spots that could help sustain farming Tilapia with BREEN technology. For example a foundry is a hot spot, a company that fires bricks is a hot spot, an incinerator, a company that makes glass bottles, and of course you could use renewable energy such as aerothermal, geothermal, biomass etc. to get heat.

In the case of the pilot being done, we are using the heat from a cogeneration power plant. Accordingly, the aim is to produce Tilapia in places that until now had been practically unfeasible because of temperature, using renewable energy or existing hot spots so that water heating is not a cost too high in production.

According to a study on the feasibility of ECONIMA Tilapia farming in Spain, the temperature is practically the only limiting factor, so that applying BREEN technologies would eliminate the only factor that makes viable Tilapia farming in Spain and Europe. All you need is a hot spot, a minimum contribution of water, 20% daily, with greenhouses and facilities for working with vegetation filters in top condition.

5.12. - Aquaponics

Aquaponics is the technique used to grow plants without soil using dissolved organic waste from a fish farming. The aquaponic system is similar to the difference hydroponic hydroponic systems that enriches the water and is already aquaponic organic matter enriched by fish farming.

Aquaponics is the technique which occurs in parallel for fish and plants, while implementing sustainable water management.

In Aquaponics three different crops are needed to achieve balance in the system, fish farming, vegetable cultivation and bacterial culture. When feeding fish, organic waste is generated mainly in the form of NH4 (Ammonios) that are harmful to fish. To eliminate these ammoniums, water is passed through a bacteriological farm (Nitrosomonas and Nitrobacter) feeding on ammoniums which become NO3 (Nitrate). Nitrates are the main food of plants, so that they can feed and filter the water to make it usable again in fish farming.

Aquaculture production as mentioned, generates an amount of dissolved organic matter, which can to be treated. The filtering tool to dissolved organic matter is the aquaponics.
Aquaponics is a filtering tool for fish farming also allowing to obtain a product that can be commercialized and be economically beneficial.

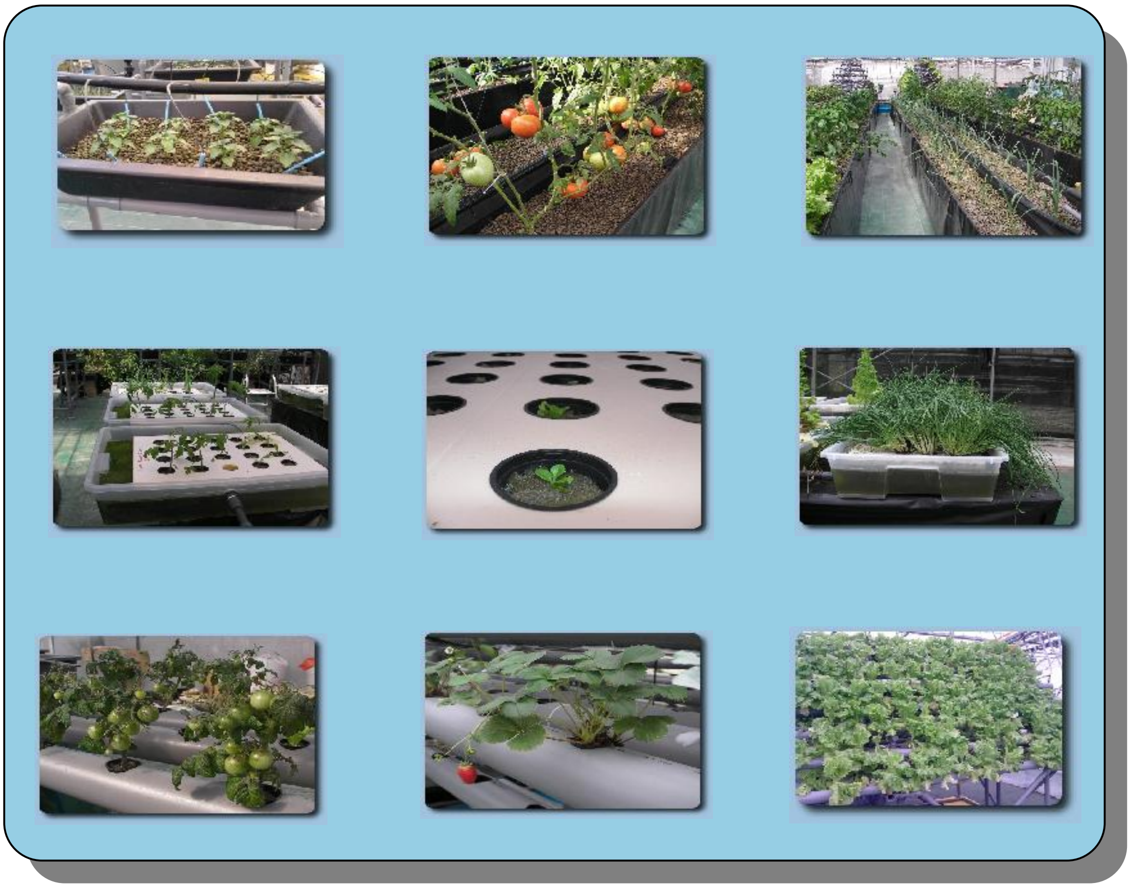
Aquaponic farming systems can have different designs but always based on three basic formats:
- crops on substrate systems, mainly arlita
- cropping system on floating plates
- tube culture systems that are recirculation

An estimated acuaponic surface should be about 3 times the aquaculture acreage or a relative of the food given to the fish and vegetable acreage. 1m^2 surface per daily 100 grams of fish food.

Aquaponics can grow any type of tomatoes, lettuce, herbs and even strawberries and tropical fruits.

Depending on the plant selected and the available surface, the systems may be of arlita, circulating tubes or floating plates as mentioned above.

In the case of plant products Dwarf floating plates give a good result of nutrient absorption and filtration. Similarly circulating tubes allow greater acreage in less space and allow crops on arlita vegetables have high kills with strong rooted.



6. - Production at industrial levels

To develop an industrial proposal it must be determined what will be the format of product sales and customer potential.

A level of aquaculture production, the most interesting is the sale of the whole product so that the client prepares it for the market.

The most interesting market for BREEN Tilapia are canteens and health centres that demand a quality meat that is white, boneless and neutral in taste and that allows use of plain white fish.

To calculate what would be the proper production of Tilapia in production units adult ration of a normal meal served by a catering service for businesses was taken as a reference.

6.1. - Calculation of production and facilities

1 serving adult fish fillet = 120 grams white
4500 servings per week = 540 kg / steak / week = 2160 kg / steak / month
2160 kg fillet / month = 5,400 kg of whole tilapia / month (40%, 60% discard steak) = KTm
KTm = 5,400 kilograms of Tilapia per month
5.400kg Tilapia Tilapia = 9.000 600 gr
1 Tilapia 600 gr = 240 gr fillet
240 gr fillet = 2 servings of adult
1 kg of steak = 8 servings
8 servings of 600g Tilapia = 4
4 600 gr = 2400gr whole tilapia
Tilapia = 5,400 kg
Tilapia 9000
Tilapia 9000
Tilapia month = 108,000 / year
Tilapia = 64 800 108 000 kg / year
1 m3 = 50 kg of Tilapia culture Biomass = 50kg/m3
5.400 kg of water Tilapia = 110m3

The dimensions of the aquaculture facility for production of 65 Mt / year would be approximately 1000 m^2.

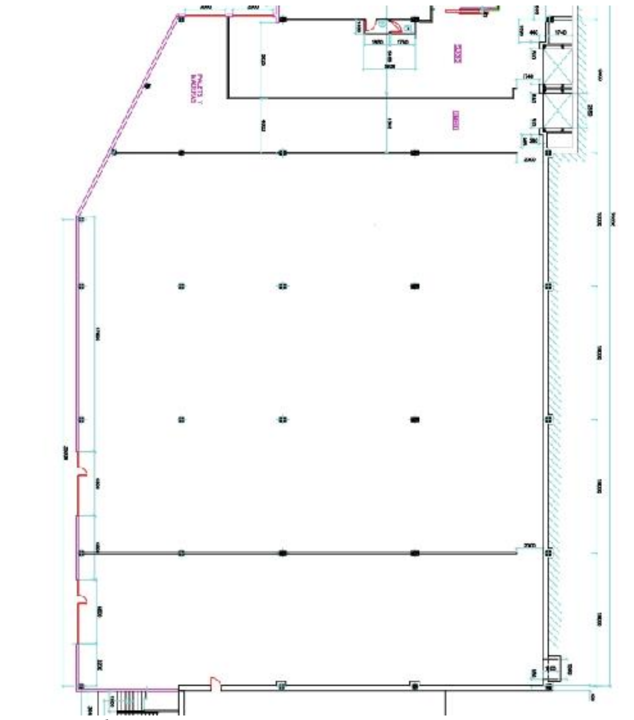
The total volume of the crop will be 700 m3 which needed a renewal of water of 10% - 15% per day that is lost by the backwash of the sand filters, evaporation in vegetable crops and plant absorbtion. Whereupon, the maximum renewal of water needed daily will be 100 m^3. 90% of the 100 m^3 of waste water, the river flow again after it has been filtered and purified so that the impact to downstream enterprises will be virtually nil.

6.2. - BREEN Industrialization Project for a Company of the fisheries sector

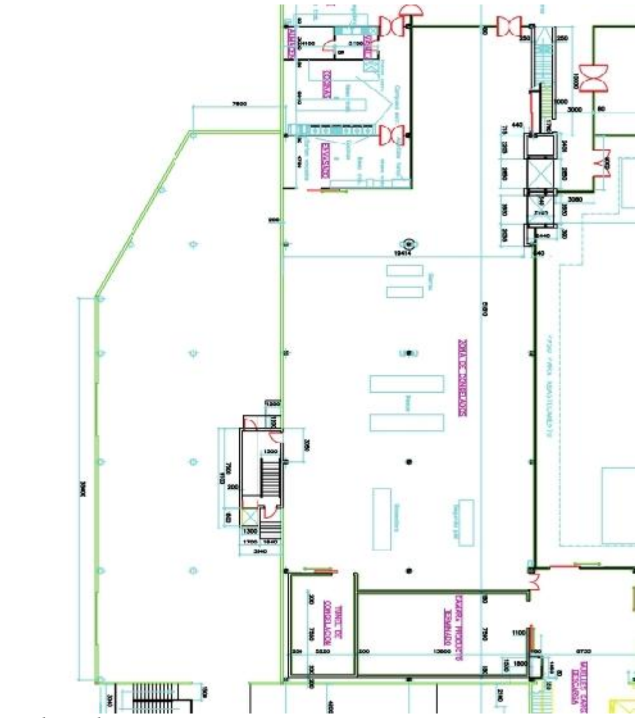
6.2.1. - Aquaculture Production, Tilapia culture

Considering plans received from the Company of the fisheries sector, there has been a rough design of a production in BREEN Aquaponics Tilapia.

These are the plans of the basement where an installation of a production unit together with the plans of the first floor where there will be parking space, you could install a high greenhouse for vegetable cultivation with Aquaponics.



Basement plan



Parking Plan

The selected dimensions of the space in the basement for BREEN farming system covers an area of 30 x 35 meters with 6 columns separated by 10 meters.
This area of approximately 1000 m2 could be used for the aforementioned Tilapia farm.

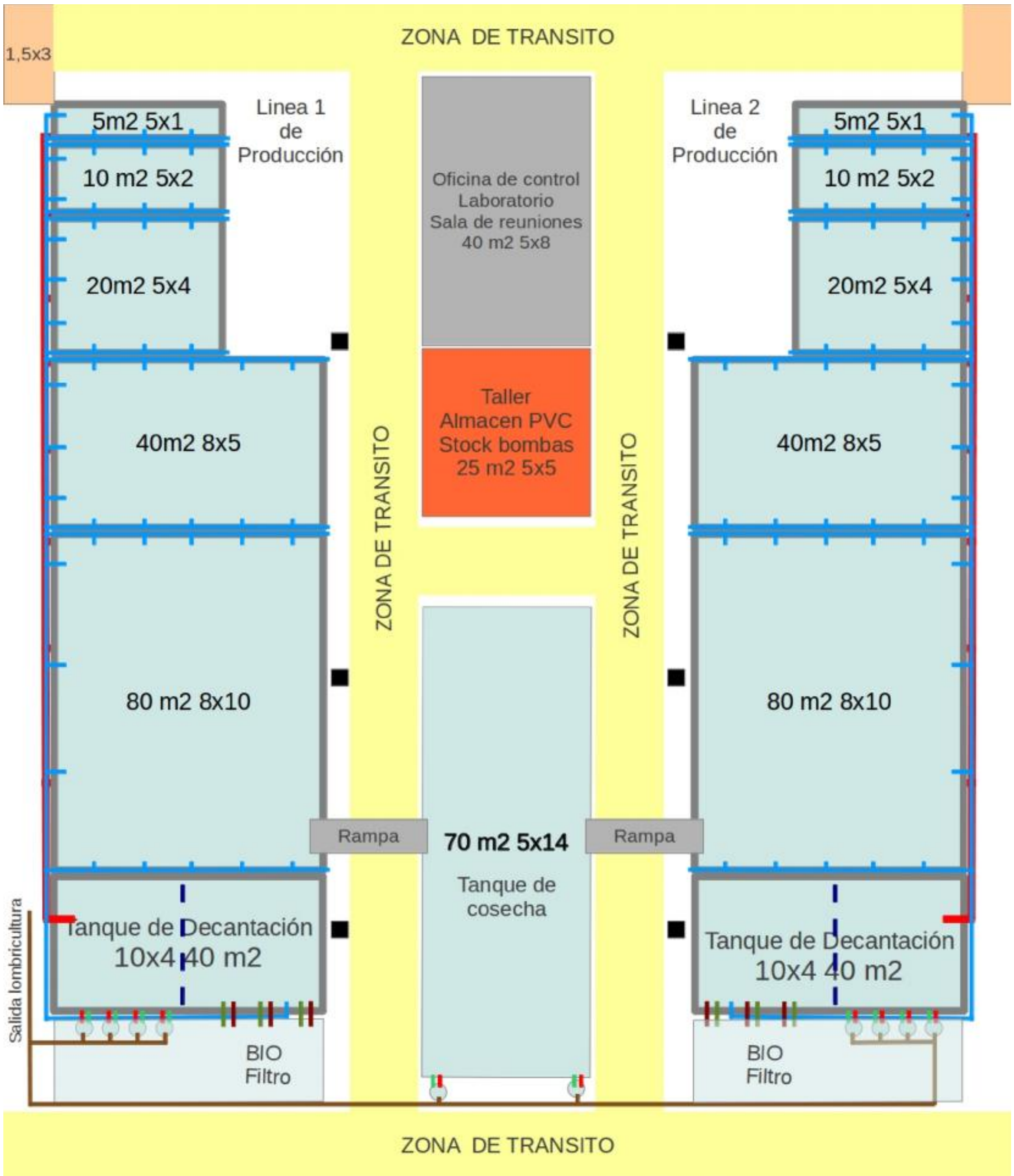
Considering the required farm volumes and the arrangement of the columns, the proposed system design could be as follows:

In this case the tanks will have a height of 1.6 meters, height of 1.40 m of water, so as to achieve the desired production volumes.

The total water volume including settling tanks, tank and fattening harvest would be approximately 700 m^3.

For farm viability in relation to the water required, it is necessary to confirm the provision of a 10% - 15% of replenishment volume mentioned daily. For correct operation of the system, it would take about 70-100 m^3 of fresh water every day, filtered water if rain and dechlorinated if drinkable.

Proposed design of fish farm:



6.2.2. - Advantages and disadvantages of a BREEN system in the facilities of the Company of the fisheries sector

The location, in a Company of the sector, of this production of a system of 65 tons annually for BREEN has advantages and disadvantages.

Advantage

The main advantage is that the facilities are currently available so that it could start at any time with the installation of a farming system. Besides the time that could be saved by having these facilities available, it includes a positive impact on the overall cost of the installation, as most of the infrastructure and fixed expenses would be resolved. In the basement area of approximately 1000 m^2, this space could accommodate a farming system and hatchery for an annual production of 65 tonnes of Tilapia.

As aheat source, one could use the heat generated by refrigeration pumps containing ammonia in gaseous and liquid at temperatures near 60 ° C. From this source of heat and by the use of cooling towers hot water could be easily generated at temperatures between 35-40 ° C for the management of heat.

Another significant advantage is related to the distribution and marketing of the product.
This Company of the sector, is a company dedicated to Basque handling and marketing of cod.
This Company, products are directed toward the hospitality industry and modern retailing with a network of close customers and consolidated exports. This company brings value to customers through market knowledge and expertise in product development and market demand, meeting the commercial and social commitments that brings value to the environment and society.

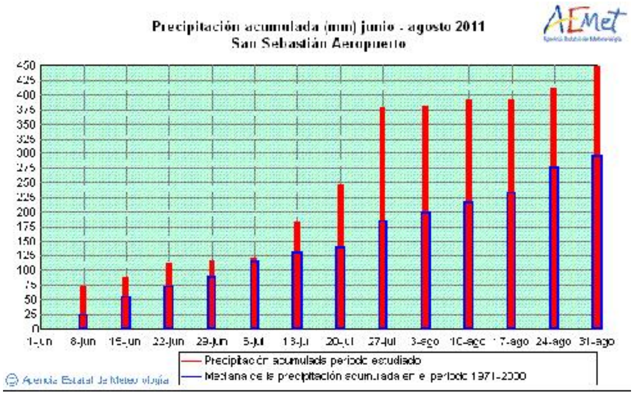
Disadvantages

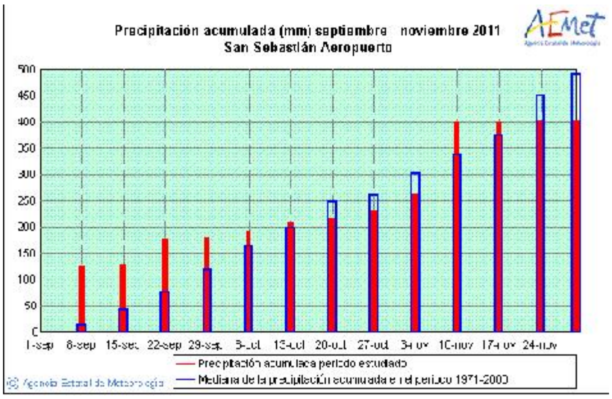
The biggest drawback that arises when designing a viable BREEN system in this Company facilities, is water.

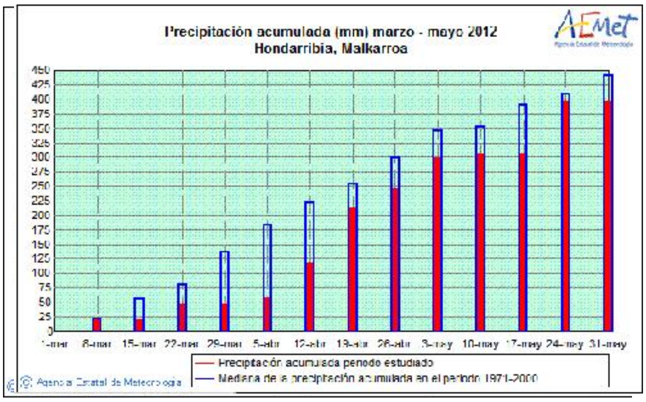
Although BREEN systems do not need much daily water intake, as working in recirculation only needs addition of 10-15% of the total volume, water is a vital point in the viability of a project of this scale.

This Company building has a roof appropriate for capturing rainwater and currently collect some of that water to a 500,000 liter rainwater tank. Although water uptake is important, we must keep in mind that there are times of the year where there is no or little rain.

Statistics accumulated rainfall in Hondarribia Airport from summer 2011 to summer 2012







Furthermore the dimensions of the filter plant using the aforementioned space is below what would be required theoretically for a good purification of dissolved organic matter.

So in order to have a larger surface area for absorption and filtration at the plant there would need to be designed a recirculation system that would work at different heights to provide more space for plants and thus achieve greater efficiency in filtering

By using circulating tubes, this limits the type of plant which could be used since this system does not allow working with certain vegetables, such as tomatoes.

The solution would be to grow vegetables to such as lettuce, strawberries, herbs and even Dwarf cherry tomatoes.

The technologically solved, the residual heat generated in the business and properly managing water consumption, a system could be put in place for a BREEN farm at this Company facilities.

We strongly advised not to use water consumption system as much as possible, since this could be an expensive system because water production and consumption with chlorine in amounts harmful to fish would force the introduction of dechlorination process which would also impact production costs.

If possible it would be helpful to have another source of water besides capturing it from the roof. The area where the company is located is not near any river or estuary from which supplies of water could be used, so the possibility would be to see the possibility of having some sort of free outdoor water supply.

6.2.3. - Material farming tanks

The costs of aquaculture facilities can vary greatly depending on the type of material and design used to build the farming tanks.

As seen in the level of facilities to produce 65 tons of tilapia annually takes several tanks and most important are the dimensions.

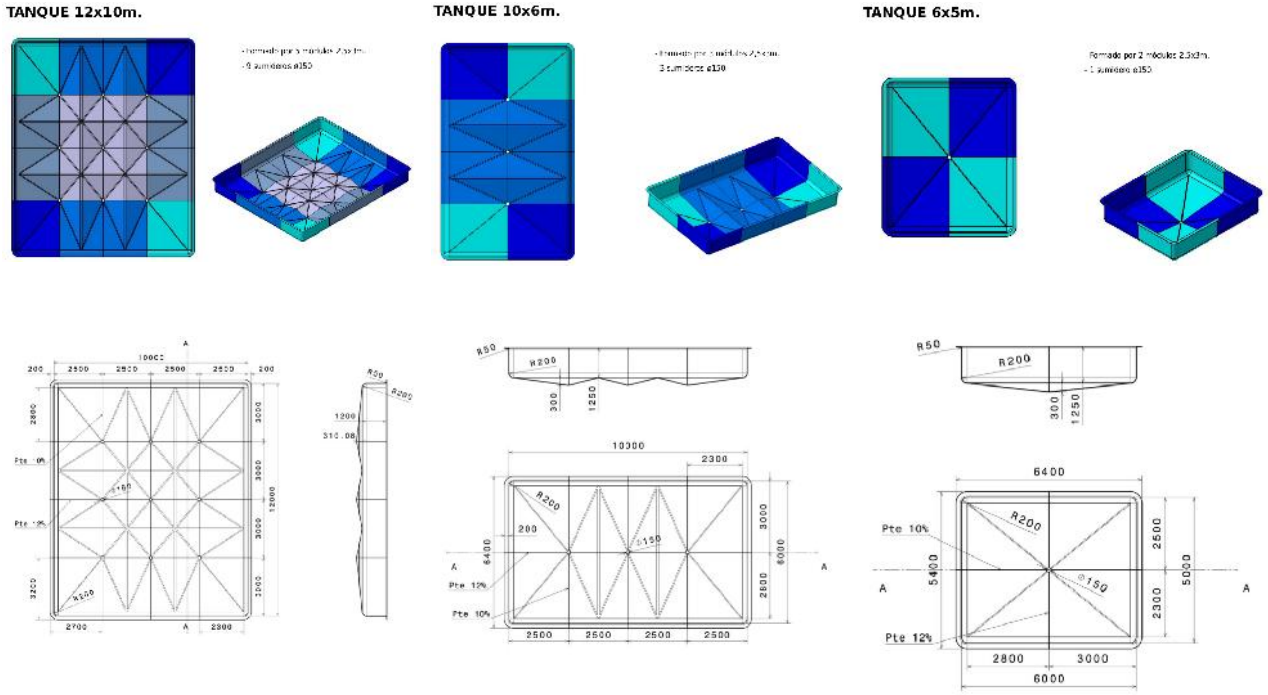
Until now, they have used materials such as cement and concrete for the construction of tanks. This type of construction is a major advantage, in addition to allowing greater flexibility in designs, the cost is significantly lower than the other systems.

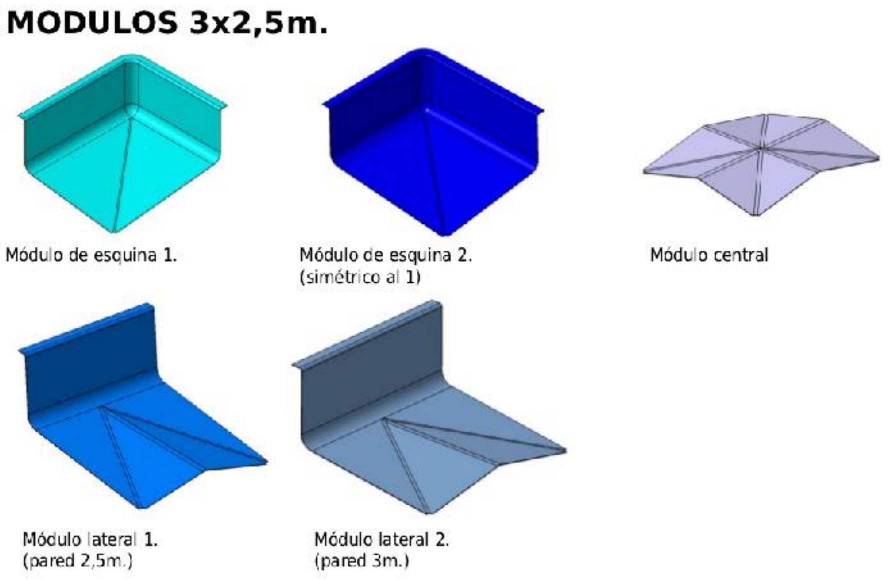
The main drawback of this type of tank construction is that it suffers severe deterioration in a short time due to the same filtering capacity that allows water seep gradually inside and deteriorating and significantly damaging the material. After 10 years the concrete tanks have cracks and leaks that need to be repaired with the added expense involved.

Fiberglass and polyester resin tanks are a good solution to the addressing the aforementioned durability and deterioration problems. Fiberglass tanks are guaranteed for 30 years and its deterioration is minimal and do not have water leakage affecting them in that time.

The main drawback of fiberglass tanks are the need to make a mold or construction premolde. This economically affects the system since the cost of manufacturing the tank must be added the much is more expensive of a system due to the manufacturing of the mold. If you need identical tanks, the same mold could be used for all, but in our case to make different sized tanks we would need 6 different molds with common parts putting them together in different ways to give us the opportunity to make what we need. In the images below you see a example for different sizes of farming tanks.

Simply molds and making them as small as possible, to minimize costs, we limited the flexibility of shapes and designs of tanks so that adaptation to existing surfaces is much more limited.



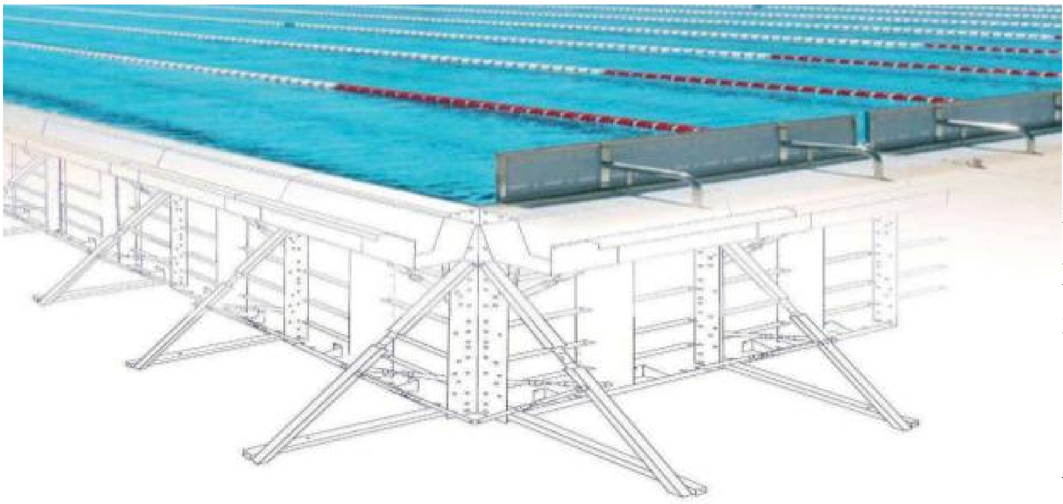


There is also a technology used for the construction of swimming pools with PVC liners of 1.5 mm used as a main structure in with galvanized steel bases, which the PVC sheets are then extend.

These films are thermally welded allowing full sealing of the tank.

The cost of such structures with liners is similar to PVC tanks with the difference that there is no need for manufacturing molds, but instead the base preparation of the tank is integrated with the concrete floor and heating system necessary for thermal insulation to avoid heat loss which would also add it subsequently unlike fiberglass systems that would lead incorporated.

The major drawback of these systems is the need for side supports or reinforcements supports to offset the tension exerted by the water on the tank walls. This limits the system for fish farming designs by BREEN as farm tanks in series which need to be glued to each other.



In each of the facilities is a personalized study to see the best option regarding tank facilities and customer needs.

In the case of this Company, circular tanks are useless since space is limited by columns and that limits the volume of large tanks. Recall that the water height is approximately 1.5 meters since a Tilapia fish is mainly pelagic and a certain height from the column uses no water and farm efficiency is inferior.

If the installation is permanent and no intention to move the tanks at any time is foreseen, the option of concrete tanks in is the most simple, quick and inexpensive. The main problem that arises with this type of tank is the need of coating them with a protective material to prevent the leakage of water into the material, which would lead to its subsequent deterioration over time.

The coating can be a fibreglass fabric and polyester although its final finish is not visually very good.

Systems may also be used as sealing liquid polymers such as CONIROOF BASF. There are different market primer waterproofing systems that serve perfectly for recirculating aquaculture farming

Before waterproofing, it is very important to correctly empty all systems: drains, pipes and under-floor heating systems installed.

The external insulation system, to lose the minimum water temperature, could be made with polyurethane foam or armaflex, used and mentioned in the pilot phase of BREEN.

To prevent evaporation of water in the tanks and in turn reduce the heat loss of the crop, it is essential to have a flip or roll cover that will cover the tanks that have the flexibility to be partially opened to handle the fish inside.

6.2.4. - Greenhouses for growing aquaponic

The aquaponic greenhouse that in this case the crop requires is approximately 2000-2500 m2. The calculation of the filtration plant requirements needed are calculated relative to the maximum feed that is given daily to the Tilapia.

Considering that the fish are fed about 2% of thier total biomass and in the case of higher crop biomass could reach approx. 19.000 kg, we must add all the biomass of all the tanks together, the maximum daily amount of food provided in different grain sizes is approx. 380 kg of feed per day.

If for every 100 grams of food supplied it is suggested to provide 1m^2 aquaponic acreage to 380 kg of food, theoretically, this project would require 3800 m^2 acuaponic growth.

Although systems using circulating tubes can be made for cultivation levels to maximize space, filtration may not yet be sufficient so that the water renewal rate mentioned above is likely to be able to maintain optimum levels.

The standard greenhouses are of fixed dimensions approximately 8 feet wide by the desired length. For this Company when a defined space, possibly standard greenhouses can not adapt to these dimensions and it would be necessary to choose ones that are customized, which would increased cost.

6.2.4.1. - Characteristics of greenhouses

The reference shown below has been provided by ULMA.

STRUCTURE:

Pilar: galvanized rectangular tube 100 x 50 mm. 2 mm x 3.5 meter eaves. (PVC cap on the end).
In lines 2.5 meters outside.
In lines 5 meters indoors.

Arc: Round tube φ 60 mm. located 2.5 meters from each other.
Belts: 3 profile side straps for plate 30 x 30 mm.

Profile 4 belts for front plate 30 x 30 mm.
1 strap round tube zenith φ 32 mm located on the ridge of the compartments without zenith sinkers.

Trellising: Set of tubular elements spaced every 5 m. and consists of a bar of 42 mm φ trellising, and reinforcing braces 5 φ 25mm to stiffen the arch-bar set trellising.

Gutter: Profile of 5m, 250 mm. wide and 1.5 mm. junction thickness between compartment (and 190 mm. wide in lateral gutters) allows efficient drainage and easy access to the top of the greenhouse. Both wings have holes every 33 cm for Fastenings the plastic profile.

Head: Structural element that makes the bond between pillars, arches, gutters and staking. It presents a single piece of stamped galvanized steel 2.5 mm. thick.

Reinforcements front: Formed by two pillars fixed closures φ75mm round tube. Catching on end, and further reinforced by four reinforcements "-arch pillars" of φ42mm. and 2 straps "bow-bow" of φ32mm. for each front compartment.

Longitudinal Reinforcements: 2 reinforcements "St. Andrew's cross" of φ42mm in central lines and 1 φ32mm sidelines. The placement was made at the beginning and end of the lines, and increases a cross every 50 meters in both cases (from the 100).

Doors: 1 door front of 3 x 3 m. tubular rail, heat galvanized and PVC coated. The door consists of two separate sheets of 1.5 meters wide, and sliding system with upper and lower guide.

STRUCTURAL MATERIALS STANDARDS:

Ulma - The materials used for the manufacture of structural steel elements have minimum yield strength of 275N/mm2.

The steel types used are:
- S275JR according to UNE-EN 10025:94 "Hot rolled products of non-alloy steel for general purpose metal building."
- S280GD according to UNE-EN 10147:2001 "Bands galvanized steel construction in continuous hot-dip".

• DX51D according to UNE-EN 10142:2001 "Bands of low carbon steel, galvanized hot dip continuous cold forming.

As for aluminum elements, such as sinker profiles (profile front partition and gutter profile) are extruded type 6063H T-6, which meet the following standards:

• Mechanical characteristics according to the UNE-EN 755-2:1988 "Aluminium and aluminum alloys. Round bars, tubes and extrusions. Part 2: Mechanical properties. "

• Dimensional characteristics according to the UNE-EN 755-9:2001 "Aluminium and aluminum alloys. Round bars, tubes and extrusions. Part 9: Profiles, tolerances on dimensions and shape. "

Hardware: This budget includes all the necessary elements of joining and sealing, such as hardware, metal gaskets, and seals needed. All hardware used is bichromate according to UNE 76.208/92 and quality 8.8 UNE-EN ISO 898-1:2000 "Mechanical properties of fasteners made of carbon steel and alloy steel. Part 1: Bolts, screws and bolts. "

Galvanizing: All tubular profiles are made from sendzimir material and are galvanized with Zinc 275gr/m2 protection and 450gr/m2.

These profiles meet the UNE-EN 10147:2001 and EN 10142:2001.

A number of other elements, such as the pillars and doors, which are continuous process galvanized by hot dip. These hot galvanized materials comply with the following standards:

• Ability to galvanize according to Standard NF A 35503-94 "Steel products. Steels for hot dip galvanizing. "

• Zinc bath under the UNE 37501-88 "hot dip galvanizing. Characteristics and test methods ".

• Terms of delivery according to the UNE-EN ISO 1461-1499 "hot dip galvanized coatings on finished products of iron and steel."

Vents:

Roof window of half arc: Window with pivot point at the top, which covers from the centre of the compartment to the gutter. The opening system of each window is by motor GW40 type that transmits the movement through a chain link shaft (φ33 x 3 mm tube.) And rack and pinion sets every 2.5 meters. The control arms are each 2.5 meters of 60x30 mm rectangular pipe, with toothed racks 2 mm thick corners and lubricated pinions.

CLIMATE CONTROL

Range Automaton "Microclimatic System" model "1000", able to control the following functions:

-

Aerial aeration.

The range of regulators Microclimatic System has 5 time periods that you can define to your convenience to adjust the temperature of the vent to the needs of the plant at all times of the day, because during all hours of the day's activity the plant and the external conditions are not the same.

For effective control, this allows the connection of the following sensors:

- Wind force (anemometer).
- Detection of rain (rain gauge).
- Outside temperature.
- Indoor temperature.
- Indoor humidity.

Probes:

The controller includes the following probes for climate control:

- Anemometer.
- Outside temperature.
- Indoor temperature.

Chest investors:

Chest type "C-IN-MA", composed by an inverter and motor protection. It is able to operate the motor in either manual or automatic, depending on the PLC which is connected.

Chest power amplifiers:

Chest amplifier SA, capable of operating up to 35 trunk inverters. It gives us the option of manual control of all inverters connected to the coffers.

COATINGS:

On roofs: Clear polycarbonate plate coating. The plates are joined together by overlapping of two sheets, and closing the ends together by sealing foam.

The plate is fixed to the structure by hooks each 32 cm, at the top of profile plate lines are added to the standard overhead line.

Sides: Clear polycarbonate plate coating. The plates are joined together by overlapping of two sheets, and closing the ends together is by sealing foam.

The plate is fixed to the structure by means of rivets and neoprene washers ensuring watertightness.

6.3.- Costs

6.3.1. - Direct staff costs

Detail	***Economic valuation***
Senior expert	76.000
Expert	77.440
Expert	77.440
Junior expert	42.240
Junior expert	42.240
Junior expert	42.240
Total	**€ 357.600**

6.3.2. - Subcontracting

Detail	***Economic valuation***
Profilux	19.000
AZTI Tecnalia	10.000
Kantauri C.A.	10.000
Mandiola composites	10.000
INSTAGI	12.000
Total	**€ 61.000**

6.3.3. - Travel costs and allowance for staff

Detail	***Economic valuation***
International travels	7.200
National travels	2.220
Total	**€ 9.420**

6.3.4. - Costs of equipment and infraestructure

Detail	***Economic valuation***
Green houses infrastructure	20.000
Sand filters	8.100
0,5CV external pumps	3.880
750W underwater pumps	1.850
PVC pipes and materials	7.800
Profilux control system	19.600
Fish tanks	59.000
Hatchery fish tanks	28.000
Computering system	8.000
Osmosis filtering system	8.000
Mechanical filtering system	4.900
Total	**€ 169.130**

6.3.5. - Aquaculture production costs and plant

Calculation of costs of production of 1 kg Tilapia

CT = Cost unloaded kg of Tilapia Aquaponics staff

Cpk = Staff costs per kg of Tilapia unfilled staff aquaponics

EC = Energy Costs

Cal = Cost Tilapia fry

CF = Conversion Factor = 1.5 in Tilapia

FC = Amount of food needed to get 1 kg of Tilapia

CPi = Cost of 1 kg of feed

CPi = 0.5 €

Time to first harvest = 10 months

Depreciation costs € 1.31

Depreciation costs = CAm

CT = CAt + CPk + Cal + CEK + CAm

Feed costs per kg of Tilapia

CAt = feed cost for 1 kg of Tilapia

CAt = HR x weight in kg x CPi Tilapia

CAt = 1.5 x 1 x 0.5 = 0.75 €

CAt = 0.75 €

Personnel costs aquaculture production

3 technicians aquaculture production

PC = Personal aquaculture production costs.

CP = 3 people = 6000 €

CP = 6,000

PT = Tilapia Production = 5,400 kg / month

CPA = Staff costs aquaculture production per kg of Tilapia.

Cpa = 6000/5400 = 0.33 € / month / kg of Tilapia

Cpa = 1.11 € / month / kg of Tilapia

Energy costs (calculated on consumptions extrapolation of pilot)

Thermal cost = 0

Electricity costs = 12,500 KW / month = 1500 € / month

CE = 1,500 x 12 = 18,000 € / year of electricity costs

CEK = CE / total annual production of Tilapia

CEK = 18,000 / 65,000 = 0.28 € electric cost per kg of Tilapia.

Fry costs

Boasting cal = own hatchery, fry costs would be included in staff costs mentioned. CA1 = 0

CT = CAt + CPA + CEK + Cal + Cam = 0.75 + 1.11 + 0.28 + 0 + 0.92 = 3.06 €

Production can improve the costs from the first crop biomass adjusting 50kg/m3 to 70kg/m3 m3 and can improve the conversion factor from continuous improvement that exists in aquaculture feed.
Improving FC improves and reduces harvest time and the cost of food.

6.4. - Income

Revenues from the productioof acuaponic activity as mentioned, allows to market Tilapia and vegetables. As mentioned above, the calculations for this Company's project is to have an aim of an annual production volume of 65 Tm Tilapia and plants some 125,000 units.

The selling price of whole tilapia will be around € 4.5. This whole tilapia later enters in the process of handling and preparation in the form of final sale that this Company deems appropriate.

If the total aquaculture production is 65 tonnes per year, to 4.5 € / kg, gives a turnover of € 292,500 for Tilapia.

For plants, it is estimated that what each plant produces could be worth € 0.30 in the market, so that the income from crop production for 125,000 units amount to € 37,500.

Do not forget that the plant production facility is actually a basic filtering tool for the system whereby effectiveness is mostly just that and what is produced is of secondary importance and a variable in the equation.

Summary of income / year:

	Income
Aquaculture production	**€ 292.500**
Plant production	**€ 37.500**

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