HAGRO-28

A NEW FRONTIER IN AGRICULTURE

INTRODUCTION

After years of research and development and after sealing the appropriate synergies with national and international agreements, ZRE2024 SL, a company driver with the aim of innovatively and uniquely developing hydroponic and aeroponic cultures worldwide, was born in January 2024.

The agricultural and energy project is called HAGRO-28; water, air and energy efficiency integrated into a single certified and safe autonomous bio-driver.

This project was born with the idea of being the driving force behind the new vitalisation of organic and eco-sustainable agriculture.

The agricultural project lends itself both to greenhouse applications but even more, as a stand-alone agricultural environment anywhere.

The pollution of the air and groundwater, the pollution of the environment and soil as well as its impoverishment, the limited availability of energy and water resources, have thus led us to devise an autonomous environment; an organism in its own right that no longer has external limits.

HAGRO-28 is therefore a system that is designed and suitable wherever it is placed; not only can it be thought of in agricultural environments and open spaces, but also on polluted sites and in cities, on roofs, in any built environment, on ships; a new way of supplying and consuming green food in every sense, and in line with current European directives.

This means that even a disused industrial area can become an agricultural production plant; from industrial pollution to agricultural industry 5.0 that reconverts the built environment and gives back to the environment the life that industry itself has taken away.

This project therefore stands as an innovative and unique project that has brought together the best technologies and efficiencies in the agricultural-energy and environmental sectors, constituting a '0' impact project and a new philosophy of conversion to true green.

The project has agricultural but also energy and environmental values; not only do we aim to produce organic crops, but also to use integrated processes that minimise all side aspects of agricultural production (including water and energy).

The proposed system i s excellent from an agricultural point of view, see the relevant chapter.

In addition to the agricultural aspect, as already stated, the project also provides for optimisation of the entire environmental and energy aspect; the water needed to grow the crops is produced from the air and a highly efficient filtration system allows the plants to grow in a controlled and healthy environment free of pollutants.

Completing the profile is a high-efficiency energy system of our own devising and saving consumption; this allows the farming business not to have to be connected to the electricity grid.

The profile is completed by a focus on agricultural waste products that are fully reused and returned to the production cycle.

In fact, HAGRO-28 is a spaceship with an autonomous energy bio-lab.

On a final note, in addition to technological innovation, it is our intention to take care of the process; all production chains will be LEED certified.

On the following pages, you will have a full and timely understanding of all that this '0' impact system can provide by innovating and optimising every aspect of the production cycle.

Clearly, as you will see, the technologies are developed and/or in advanced development, but to be able to have a relevant penetration of the project and a reach that makes sense at a European and global level that can bring the benefits of this technology and a new sustainable environmental culture, it is necessary today to have an adequate initial investment that can bring the necessary resources and the expected political and social spread.

Here is a summary of the project which aims to address three aspects:

- An aspect of engineering and activation of the production and commercial base as well as the industrialisation of products sold;
- An ecological aspect of land penetration with the creation in various parts of the world of 'reconverted industrial islands' (we plan to purchase industrial areas from converted to bio-laboratories);
- An aspect of social and ethical solidarity dissemination.

Before describing the project, on the following pages we present the agricultural idea and the associated engineering idea separately.

INDEX:

CAP. 1

DESCRIPTION AND DETAILS OF TECHNOLOGIES AND PERFORMANC

1.1 - AGRICULTURAL IDEA: AEROPONIC CONTAINER FARM

AEROPONIC CONTAINER FARM
FOR VEGETABLES

The first aeroponic container using NFT software to control the entire production cycle, raw materials and costs

TECHNOLOGY WITH
RESPECTO NATURE

ABOUT

The main features of our products are:

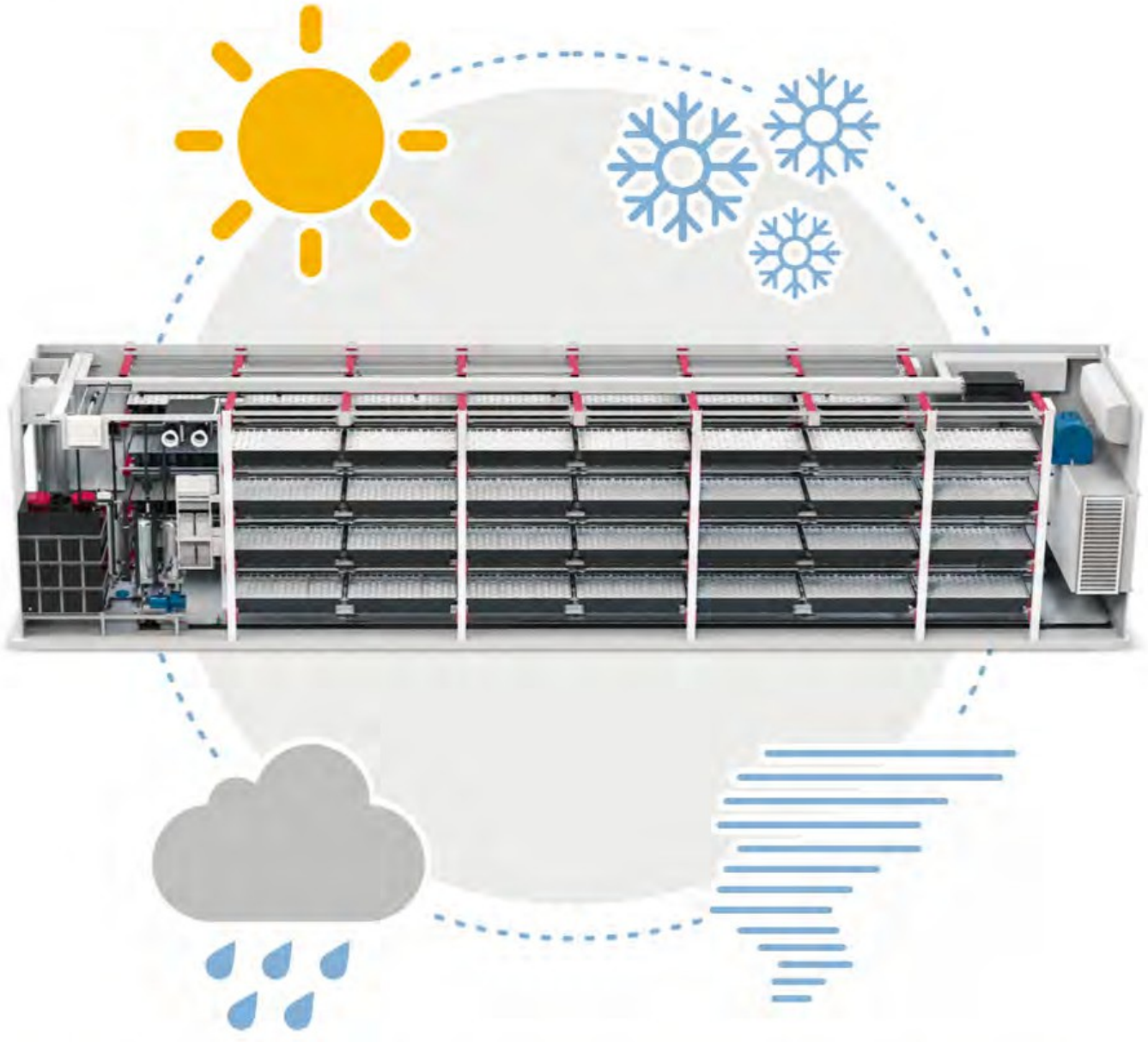
LED GROW LIGHTS

VERTICAL GROWTH SYSTEM

CONTAINER FARM

FEATURES

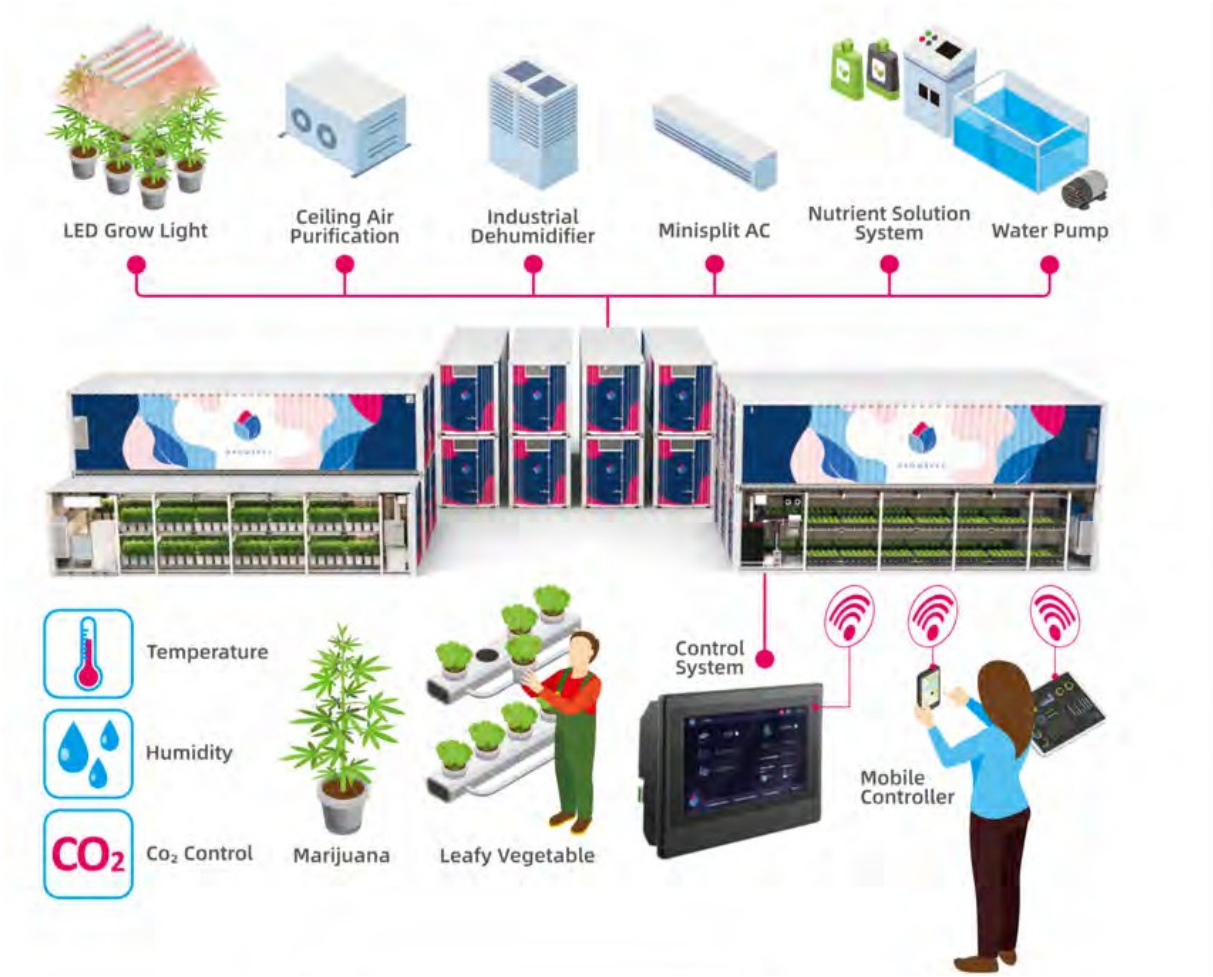
We have 3 standard containers for sowing vegetables. Inside these container farms is an independent climate system, which is not limited by external conditions and can operate in an environment of -40°C~40°C. It can be used not only indoors but also outdoors and can withstand rain, snow, intense cold and very hot weather.



AEROPONIC-CONTAINER FARM FOR LEAFY VEGETABLES

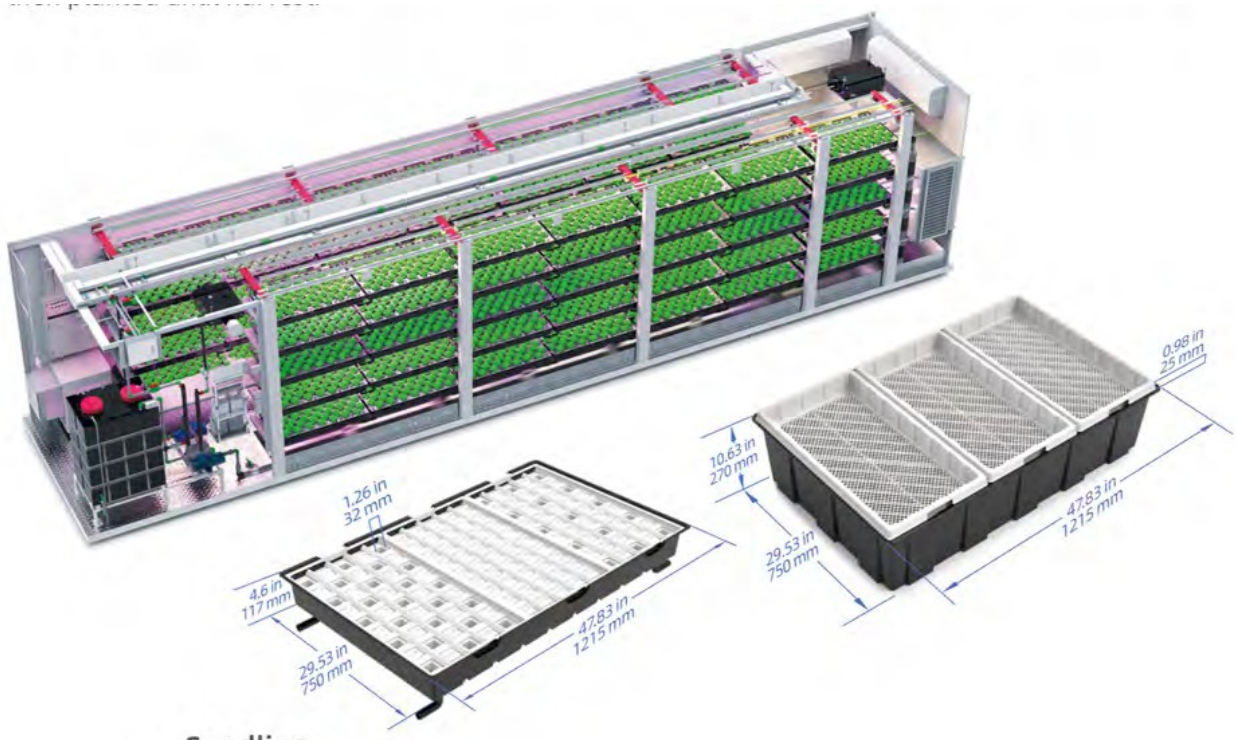
With a 10-inch touch screen, you can set the nutrient solution formula, internal temperature, humidity, concentration of CO2, the speedof air circulation, light strategy (including light intensity and time control), the strategy of irrigation, etc. Aeroponic Container Farm will . work automatically according to your settings. In addition, Aeroponic Container Farm is also equipped with a fire p r o t e c t i o n system, an i n d o o r air sterilisation system, an indoor and outdoor air exchange system, etc. Added value is the internal 'water balance'.

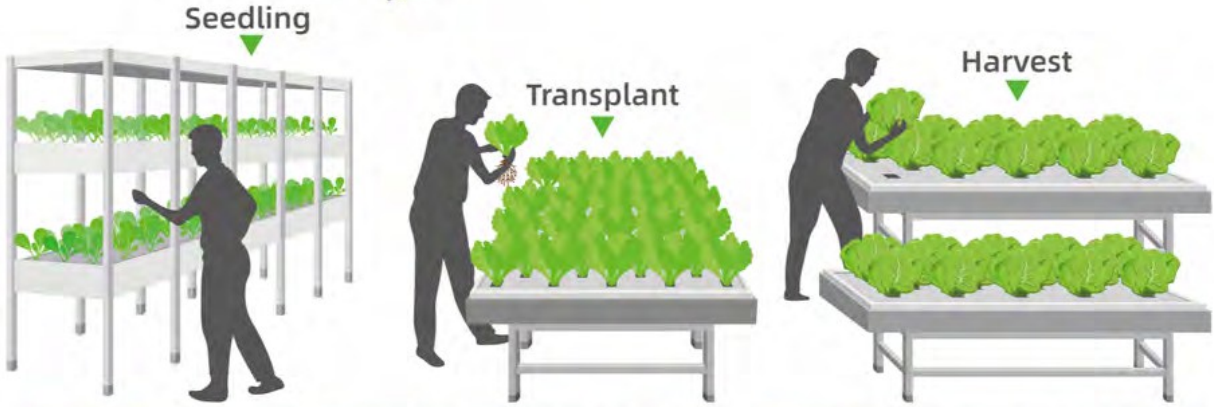
After the water has mixed with the fertiliser, it enters the air through plant transpiration. Condensed water will be collected through the air conditioner and dehumidifier, then returned to the nutrient solution reservoir. After the fertiliser has been mixed, filtered and sterilised, the roots of the plants will be irrigated, and the collected water will again participate in the cycle process.



VE-VA7560

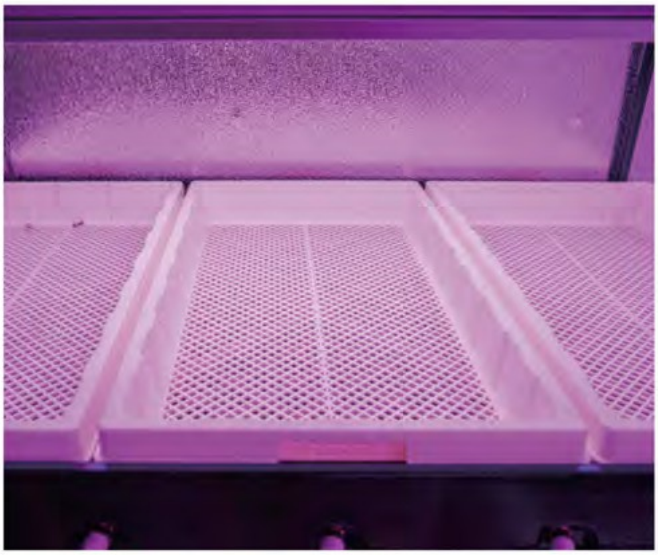
This Container Farm adopts aeroponic irrigation; the mist at the bottom of the seedbed brings the necessary nutrients and oxygen directly to the roots. It is suitable for sowing 'single' vegetables such as **lettuce, parsley and basil**. Seedlings are grown in the nursery area, waiting for the roots to emerge before the vegetable seedlings can be transplanted to the planting area and then planted until harvest.

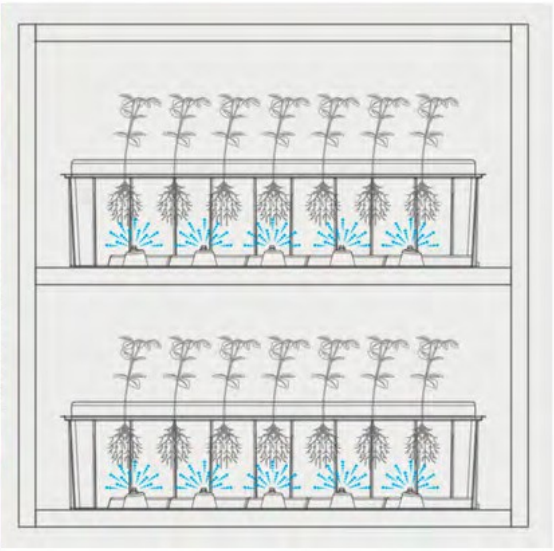




VF-VAC

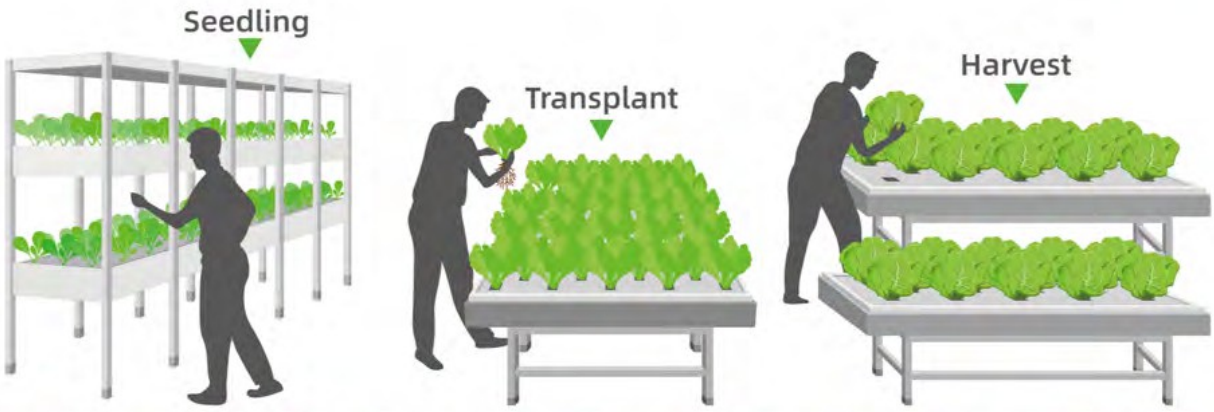
This Container Farm adopts aeroponic irrigation, suitable for planting sprouts such as **peas, mung beans, amaranth and herbs such as thyme and mint**. These plants grow in 'clusters' and there is no need to move the seedlings from seed to harvest. After the seeds have been soaked, they are placed on paper or fibre cloth in the planting trough and can be planted until harvest.





VE-VH9450

This Container Farm is divided into a nursery area and a growing area. After the seeds germinate and take root in the nursery area, they are transplanted to the growing area and planted using shallow liquid flow technology. It is suitable for growing leafy vegetables such as **lettuce and basil**.



BETTER BUSINESS FLOW

Growing vegetables or herbs in the Container Farm of Uese Italia Spa can also optimise your business processes. All you have to do is pull out the seed tray, place it in a waterproof base tray and cover it with a transparent sheet to sell 'freshly harvested vegetables'.

CUSTOMISATION

Uese Italia Spa can also customise container products. These requirements include:

PARAMETERS

Functions / Name	Aeroponic-Cont:ainer Farm For Leafy Greens	Aeroponic-Container Farm For Microgreens and Herbs	Hydroponic-Container Farm For Leafy Greens
Model#	VF-VA7560	VF-VAC	VF-VH9450
Total Weigiht	7,SO0kgs-8,000kgs (16,500 lbs - 17,600 lbs) l,l		
Inner Space	9Bcm(L) x 230cm (W) x 264cm(H) / 472 "x 90.5" x 104"		
Corridor Widtih	62cm (24.4"}		
Maximum A.C Capacity	60,200 BTUS		
Sterilisation Rate of Internal Air	5-30 times/hr		
Max. Deihumidification	306L/Day (647 pints/day)		
Max. Humidification	6L/hr (13pints/hr)		
QTV Sprinkler	4 pcs		
Controllable Temp. Range	16a(~30°(		
Input Voltage / Frequency	17 0V-277V, 50/60 HZ.		
Max. Power	21KW		
Planting Tiers	4 ttier	4 tier	5 tier
Dosing System	4 Channels		
Max. PPFD	400 flmol/s.m^2		
Ught Dimming Range	0-100%		
G row Steps	seeding and growing 41 m^2 /	seeding and harvest 48m^2 / aeroponic	seeding and growing 60m^2 /NFT
Canopy Area/ Inigation	aeroponics 7m ^{2} / aeroponic	no seeding area no need	7m ^{2} /ma11ual jaeroponicforoption) yes
Seeding Area/ Irrigation	yes	aeroponìc base tray (BTl)	NFT Base tray(BT2▶ mesh growtray (GT4), 75mm celi tray(GTS)
Transplant:ing	aeroponìc base tray (BTl) mesh grow tray (GT4), 75mm ceti tray(GTS)	mesh grow tray (GT4)	leafy greens
Base Tray	leafy greens	microgreens and herbs	
Planting			
Plants Suitable			

- OST-SERVICE SUPPORT-

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1.2 - ENVIRONMENTAL ENERGY IDEA: HYDROPONIC INNOVATION

INTRUDUTION

HAGRO 28, as you have seen from the previous paragraph, is in every respect a technological excellence from the point of view of agricultural production.

The most limiting factors in all agricultural production have always been the environment (which with HAGRO28 does not affect) and production costs.

In particular, among the once meagre production costs, the energy costs that are now absolutely not negligible for cultivation in 'controlled' environments are of relevance.

Another cost that is increasingly a limiting factor is water.

HAGRO28 overcomes all these problems; in particular, the technologies outlined below decrease the incidence of water use by 75% and energy use by 76% compared to traditional cultivation.

As you can see, this is in fact the keystone in BP.

A note also epr the air filtration system: the air enters the greenhouse clean and this allows a plant and cultivation growth in a controlled and healthy environment by increasing the enzyme by 15% (resulting in a strong limitation and need for any kind of pesticides and a reduction in the effects of pests and pathogens of various kinds).

01/ GREEN - AWG - 5000

A device for producing water from air with supervision, treatment and mineralisation system.

02/ MX INDUCTION

An air polarisation device diffuses oxidants into the environment that neutralise pathogenic microorganisms from the air and from plant and wall surfaces.

GAMMA GREEN - AWG

GREEN-AWG-100

Production capacity: 100 Liters/24 ore
Energy consumption 1.32 KW
International Power Supply AC 220V 50Hz, AC110V 60HZ single-phase voltage
Water tank 40L
Refrigerant R410A
Weight 140 KG
Dimensione 1250*542*1263 MM
Loading Quantity 20GP 14 PCS 40HQ 54 PCS

GREEN-AWG-250

Production capacity: 250 Liters/24 ore
Energy consumption 3.4 KW
International Power Supply AC 220V 50Hz, AC110V 60HZ single-phase voltage
Water tank 45L
Refrigerant R410A
Weight 550 KG
Dimensione 1860*950*1660 MM
Loading Quantity 20GP 5 PCS 40HQ 12 PCS

GREEN-AWG-500

Production capacity: 500 Liters/24 ore
Energy consumption 6.3 KW
International Power Supply AC 380V 50Hz, AC440V 60HZ three-phase voltage
Water tank 90L
Refrigerant R407A
Weight 810 KG
Dimensione 1935*1150*1710 MM
Loading Quantity 20GP 5 PCS 40HQ 10 PCS

GREEN-AWG-1000

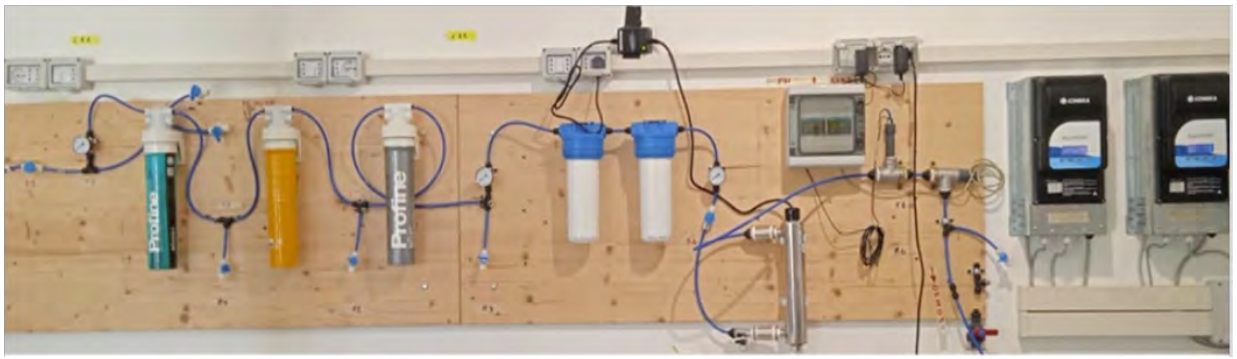
Production capacity: 1000 Liters/24 ore
Energy consumption 12.3 KW
International Power Supply AC 380V 50Hz, AC440V 60HZ three-phase voltage
Water tank 180L
Refrigerant R407A
Weight 1070 KG
Dimensione 2165*1550*2076 MM
Loading Quantity 20GP 3 PCS 40HQ 7 PCS

GREEN - AWG

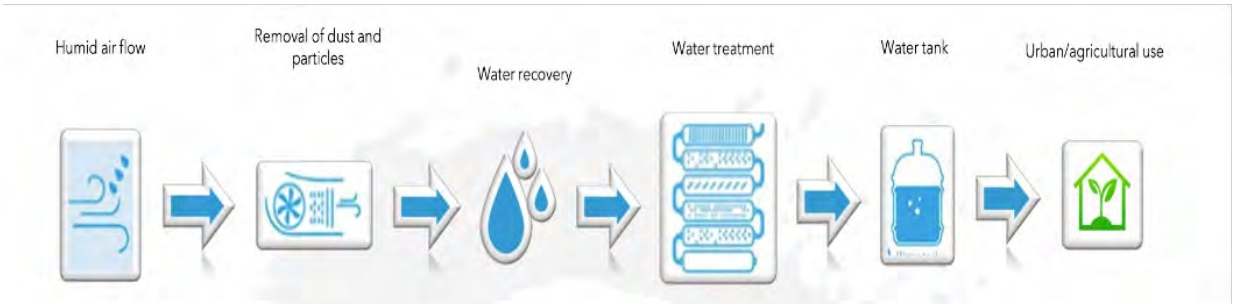
The device draws in moisture-laden air, cools it down to condense the moisture, which is collected in the reservoir and then discharges the dry air into the atmosphere.

With the GREEN-AWG, water can be extracted from moisture in the air in a range from 500L to 10,000L, depending on size. The water produced by the GREEN-AWG is treated before being used for final use.

Thanks to specific filters, hardness is reduced and impurities are removed.



Water generated by atmospheric moisture is channelled into reservoirs. Subsequently, the water undergoes ad hoc potabilisation and mineralisation processes according to the needs of crops or communities before being used for urban and/or irrigation purposes.



CAP. 2

DESCRIPTION AND DETAIL OF TECHNOLOGIES, PERFORMANCE AND ENVIRONMENTAL ENERGY IDEA: HYDROPONIC INNOVATION

2.1 - AGRIPONIC: COST-BENEFIT ANALYSIS OF AEPONIC CULTIVATION IN RELATION TO TRADITIONAL TECHNIQUES

The Agriponic project - promotion and dissemination of aeroponic technology in agriculture -

The project "Agriponic, promotion and dissemination of the aeroponic technique in agriculture" is financed within the framework of the ENPI Italy-Tunisia 2007-2013 Cross-border Cooperation Programme. The project is led by the Municipality of Ragusa in partnership with URAP Manouba - Union Régionale de l'Agriculture et de la Pêche de Manouba, Confagricoltura Ragusa, CRDA Manouba - Commissariat Régional au Développement Agricole de Manouba and Svi.Med. Onlus, author of this study. The project also boasts the collaboration of various local authorities in the Province of Ragusa that have participated in various ways in the implementation of the project activities and whom we wish to thank for having given impetus to the new generations, who have discovered new ways of doing innovation in agriculture.

The Agriponic project aims at the dissemination and exchange of experience among partners on the 'aeroponic' cultivation technique applied to horticulture, floriculture and the production of medicinal plants. Aeroponics is a highly innovative cultivation technique in a protected environment; it is characterised as 'above-ground' cultivation and can be closed-cycle, representing a valid alternative to classic 'under glass' cultivation. In aeroponics, the plant roots are suspended, have no substrate and the plants are fed by means of a saline solution that acts directly on them. This technique allows for a reduction in the use of traditional fertilisers, nitrates and heavy metals, the possibility of reusing irrigation water and a limitation on the over-exploitation of land by intensive cultivation.

Through the project, in addition to this *'Cost-Benefit Analysis'* study on the aeroponic technique in relation to traditional cultivation techniques, an *aeroponic pilot greenhouse in Manouba*, a *demonstration room* on the aeroponic technique by means of a scale model*, an INFO POINT* at the Municipality of Ragusa, and *training and information seminars* held between Ragusa and Manouba, aimed at training and informing operators in the sector, were realised.

INTRODUCTION

This study is dedicated above all to technicians and those working in the sector and aims to become a useful tool for those who have to start a business, as it provides interesting information on the choice of the type of crop to put into production and the type of technological tools to support it. The data contained in this volume are the fruit of the meetings (technical workshops, seminars, etc.) held during the course of the Agriponic project and are intended to provide some objective elements for evaluating the advantages and disadvantages of the aeroponic cultivation technique, compared to traditional greenhouse cultivation.

The first technical-level meeting, called an atelier, which took place in Scicli on 23 March 2012, in the presence of the project partnership, experts and some local agricultural producers, introduced the characteristics of aeroponic cultivation, noting the first experiences made in Sicily in the 1990s. On 21 May 2012, the project leader, in the presence of producers and experts in the sector, invited the Tunisian consul in Palermo and the Minister of Agriculture and Fisheries to sign a Memorandum of Cooperation, which envisages, among other things, the establishment of cooperation relations in the fields of agriculture, agro-food, and livestock breeding, as well as the exchange of experiences and skills among the various experts of the parties involved in the sectors of interest.

Other technical workshops were organised in Manouba, at the headquarters of a Tunisian Research Centre, the CTPTA '*Centre Technique* de la *Pomme de Terre* et l'Artichaut', specialised in research on potato and artichoke cultivation, where experts were invited to give presentations on the Tunisian experience with above-ground cultivation and the implications of the aeroponic technique in the Mediterranean environment, in the presence of many Tunisian agricultural producers, who asked questions on the commercial opportunities of products derived from the aeroponic technique and the economic feasibility of cultivation.

Other workshops held in Ragusa also featured students from the 'P. Grimaldi' Professional State Institute for Agriculture and Rural Development in Modica, who were engaged in the creation of a model aeroponic greenhouse at the school, which produced excellent results. The institute also took part in the Agriponic project's training seminars, together with the Industrial Technical State Institute of Ragusa, whose students were involved in a study trip to Holland, which enabled them to learn about the Dutch reality in the field of off-ground and specifically hydroponics.

In Ragusa, on the occasion of the 2012 Mediterranean Agrifood Fair, the latest project meetings highlighted the investment opportunities that Tunisia offers in the agricultural sector with the intervention of a representative of the Tunisian Ministry of Development and International Cooperation, who highlighted the importance of cross-border projects and the need to adopt new cultivation techniques, to ensure productivity in agriculture, allow the countries' economies to benefit also in terms of competitiveness in international markets.

In the course of the project activities, interviews were also conducted with some of the area's agricultural entrepreneurs in order to gain a better understanding of the current situation in agriculture and to understand whether off-ground cultivation techniques can be considered as a great opportunity to ensure an economic recovery for the agricultural sector and a springboard for the economy of the Mediterranean countries. In fact, it emerged that almost all of the companies interviewed, in addition to those that took part in the technical meetings, had already converted their farms to off-site cultivation several years ago.

This volume examines two studies on the aeroponic technique, presented during the project workshops, and an analysis of the traditional greenhouse cultivation technique. The first study (which we will call Study I), illustrated by Dr Pazienza, evaluated the economic advantages of the aeroponic technique, by means of a cost analysis, as well as the advantages for the environment, since soil exploitation, the use of plant protection products and the use of water resources for irrigation are reduced to a minimum. The other study (which we will call Study II) was recently carried out by the company Aeroponica Industriale srl, winner of the tender for the construction of the pilot greenhouse in Manouba, which conducted the analysis on the basis of research, experiments and data from its experience in the sector, as it owns several aeroponic plants in Italy.

Ch. I COMPARISON BETWEEN TRADITIONAL CULTURAL TECHNIQUES AND OFF-ROUND TECHNIQUES

The analyses examined present a comparative assessment of various production systems:

- traditional all-round production method;
- production method in a protected environment (field greenhouse);
- production methods with above-ground cultivation technology, open or closed cycle, in a protected environment (greenhouse)

The traditional all-round method

advantages:
low investment (if bare land ownership is excluded); low maintenance costs;
execution of production steps with the aid of mechanical means;
low incidence of labour, linked to the type of product cultivated;

criticality:
it is not possible to cultivate on all types of land; seasonality of production;
quantities produced, related to weather conditions and soil fatigue;
50% of the production cost is made up of land preparation (from weed control to fertilisation);
irrigation requirements;
almost exclusive production for the processing industry.

The traditional method in a protected environment (field greenhouse)

advantages:
possibility of counter-season production;
production in a protected environment with protection of the products from the weather (depends very much on the type of greenhouse structure used);
greater consistency in the quantities produced;
production for sale of fresh produce, with various types of packaging; increased control over pests and pathogens.

criticality:
high cultivation costs for soil preparation and thus sterilisation, the use of pesticides and fertilisers, the purchase of materials for the construction of the greenhouse etc. ;
difficult scheduling of cultivation phases;
high energy costs for air-conditioning the greenhouse;
the repetitive and exhausting work performed by the
labour force; the low productivity;
soil fatigue due to over-exploitation; low plant density per
square metre;
contamination by external agents such as fine dust etc. high
use of water;
low shelf life with high amounts of waste; difficult
implementation of quality and traceability systems; low
profitability.

The methods with cultivation technology above ground, open or closed cycle, in a protected environment (greenhouse). A further division must be made: hydroponic and aeroponic systems.

Hydroponics can be defined as the technique that allows plants to grow without the use of soil, replaced by a more or less inert material (such as perlite, peat, pumice stone, sand, etc.), intended to support the plants, to which a nutrient solution is added containing the elements necessary for plant growth.
Some of the most commonly used substrates include:
-peat: it is derived from the decomposition of certain plant species and is characterised by very low disposal problems, given its easy degradability, and low planting and management costs;
-Pearlite: a special type of volcanic rock, capable of expanding up to 20 times its original volume, has excellent drainage and oxygenation;
-rock wool (or grodan): this is a volcanic rock (basalt) which, when suitably treated, reaches a volume approximately 90 times greater than its initial volume. It does, however, have the disadvantage of creating considerable disposal problems at the end of the cultivation cycle;
-Coconut fibre: among the most practical and efficient, it is environmentally friendly and recyclable; unlike peat, it remains soft as the months pass, thus facilitating easier plant development.

advantages:
intensive production system;
possibility of recovering disadvantaged cultivation areas;
possibility of cultivation in disadvantaged climatic zones;
possibility of overcoming difficulties related to reduced soil fertility; possibility of extending harvest calendars with continuity of production; possibility of achieving better product standardisation;
production for sale of fresh produce, with various types of packaging; pest and pathogen control.

criticality:
The hydroponic method results in wastage of soil (so-called unproductive tares), which can be up to 40-50% of the protected area;
release of chemical pollutants into the soil following the use of disposable nutrient solutions (in the open cycle)
difficult disposal of used substrate materials, substrate replacement at least every two years.
risks of root asphyxia and crop stress,
difficulties in the technical preparation of workers to conduct cultivation.

Aeroponics is an advanced cultivation technique that aims to achieve the first process innovation in agriculture.
The plants, free-rooting in every vegetative phase, are placed on special perforated panels intended only to support the plant; these panels rest on a gutter that, in addition to supporting the panel and the plant, isolates the root from the outside environment. The nutritive solution is nebulised, according to precise timing, directly onto the root system, managing to recover and reuse that which is not absorbed.

advantages:
Among the advantages of this cultivation system, in addition to being an intensive production system, we can highlight:
the possibility of recovering disadvantaged cultivation areas;
the possibility of cultivating in disadvantaged climatic zones;
the possibility of overcoming the difficulties related to decreased soil fertility;

reduction of unproductive tares, with the possibility of using the entire volume of the greenhouse;
the possibility of extending harvest calendars with continuity of production;
the possibility of achieving better product standardisation;
the possibility of changing the parameters of the nutrient solution in order to achieve the best crop results;
reduction of phenological phases and optimisation of vegetative phases;
increased root oxygenation;
absence of fungal diseases and algae formation; pest and
pathogen control;
possibility of producing a large number of high quality, high image horticultural and floricultural species with the same equipment;
reducing the use of pesticides and pesticide treatments by 100 per cent and chemical fertilisers by 90 per cent, thus protecting the environment and producing a biologically perfect product;
95% reduction in water consumption compared to conventional cultivation;
possibility of avoiding any pollution of groundwater and the environment thanks to the 'closed-loop' system;
possibility of very fast transplanting and crop change times; possibility of
fully mechanised production;
production for the sale of fresh products, with various types of packaging.

criticality:
On the other hand, the disadvantages can be summarised:
high financial investment in facilities
Computerised production management and control requires agricultural operators with good professionalism.

One cannot fail to highlight the fact that this technique reduces water use by 98%, fertiliser use by 60% and pesticide use by 100%, not to mention the CO_2 emission reduced by 50%.

Chapter II AEROPONICS: COST-BENEFITS ANALYSIS

II.1 Study No. 1

According to study 1, among the species cultivated in aeroponics, lettuce (iceberg, Chinese, romaine and cabbage varieties) has the highest productivity, followed by escarole and blond chicory. The study evaluates the costs involved in running an aeroponic greenhouse in relation to two examples: a greenhouse producing lettuce and a greenhouse producing rocket. Table 1 lists the species that can be grown in aeroponics:

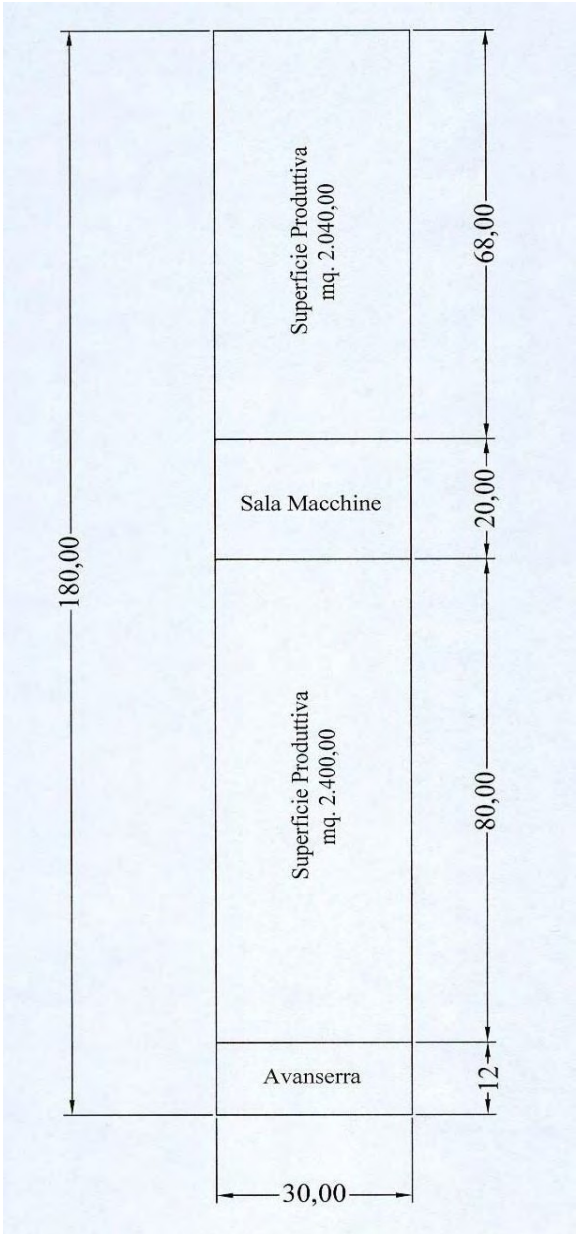
Table no. 1

Varieties	Capacity (pp/sq.m.)	Productivity (Kg)
Lettuces: Cabbage, Romaine	25	12,5
Chinese lettuce	50	25
Iceberg lettuce, Batavia	25	25
Red husk	25	6,25
Escarole, Blond Chicory	25	8
Red chicory	25	6,25
Mache large leaf	100	3
Misticanza 5 species	100	3
Arugula	100	1,5
Spinacine	50	1,5
Mizuma	100	1
Watercress	100	1
Valaeriana	50	2,5
Dandelion leaves	50	2h
Baby Leaf	100	1,5
Saffron + Ginseng and other bulbs (Bulbs)	50	Variable

Fig. 1 Greenhouse design

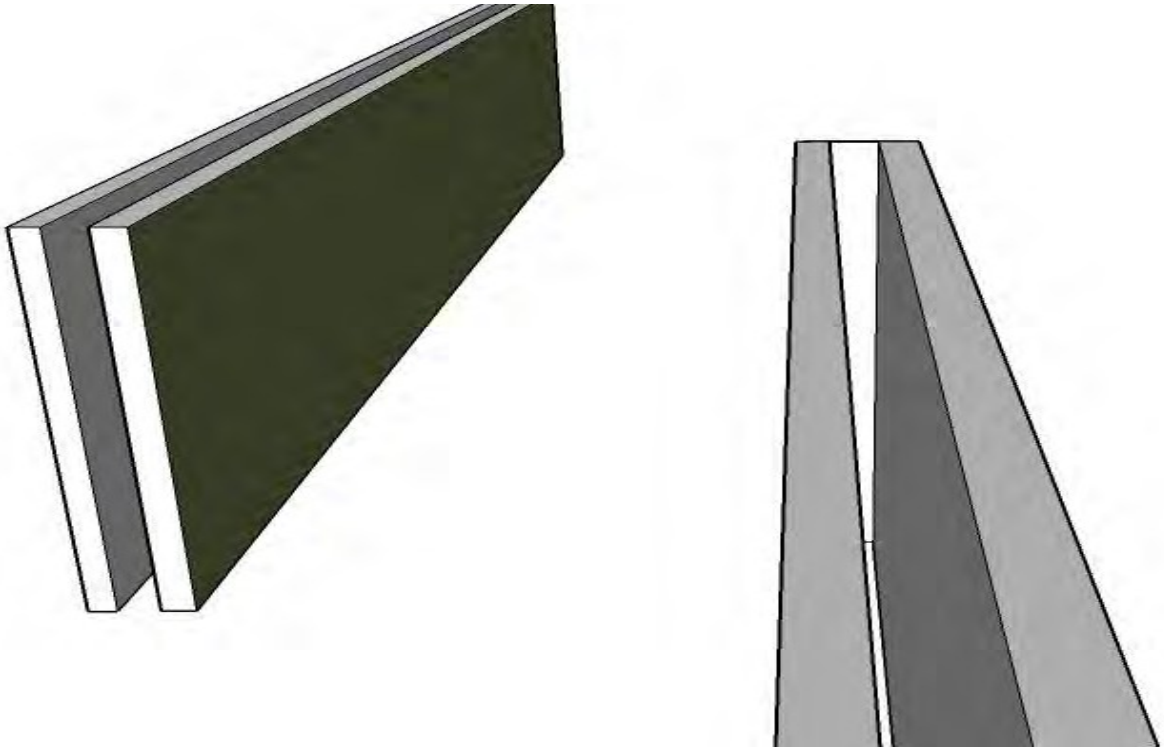
The extension of the greenhouse examined by the study is 180x30 sqm = 5400 sqm (Fig.1) and is subdivided into AVANSERRA, i.e. the area where the processing line is located and the cold room for the storage of IV gamma finished products; GREENHOUSE A used for lettuce cultivation and which has an extension of 2400 sq.m; MACHINE ROOM, a space of 600 square metres where the germination and rooting cell groups are located, the mycorrhization group and the reverse osmosis water treatment plant; 2040 square metres is the extension of the area dedicated to rocket cultivation, the so-called SERRA B

(Figure 1 shows the floor plan of the greenhouse)



The pallets for SERRA A are developed vertically and have 2 façades (Fig. 2), each façade is 2 metres high and 78 metres long, thus developing a surface area of 156 square metres.

Figure 2 pallets in section



In total, each pallet develops 312 square metres. The factory is equipped with 30 pallets, approximately 60 cm apart to allow for the passage of labour. Each square metre of the pallet accommodates 25 heads of lettuce with a daily yield of approximately 12.50 kg of product with a growing time of 30 days, so a pallet with a surface area of 312 square metres will produce 3900 kg of lettuce per day (default estimate). It was therefore concluded that each pallet produces 15600 packs of bagged salad per day, which is priced at €0.60 each (approximately €9,360.00 per day).

Tab.2 Greenhouse production calculation with lettuces

Lettuce Production	**day**	**year** (360 days)
Surface sqm	312	112.320
Production Kg/sqm	12,5	12,5
Chimneys/sq.m.	25	25
Single head weight Kg	0,5	0,5
Total production per pallet Kg	**3.900**	**140.4000**
Weight single pack in IV range Kg	0,25	0,25
Total Packages per pallet No.	15.600	561.6000
Single pack value	€ 0,60	0,6
Total value of production (expressed in days)	€ 9.360,00	
Total value of production (expressed in months)	**€ 280.800,00**	
Production value year		**€336.9600,00**

The pallets for SERRA B are also vertical and have a length of 66mx2h, thus developing a total surface area for the two sides of 264sqm. The pallets total 30 and are spaced 60 cm apart. Each square metre holds 100 heads of rocket, with a daily production of 1.5 kg per square metre per day, with a total production per pallet per day of 396 kg and 5657 bags. The estimated yield is € 3,111.43 per day, a yield obtained considering the cost of € 0.55 per bag.

Tab.3 Calculation of greenhouse production with rocket

Arugula production	**day**	year
Pallet surface: sqm	264	95.040
Production Kg/sqm	1,5	1,5
Chimneys/sq.m.	100	100
Single head weight Kg	0,015	0,015
Total production per pallet Kg	**396**	**142.560**
Weight single pack in IV range Kg	0,07	0,07
Total Packages per pallet No.	5.657	2.036.571
Single pack value euro	€ 0,55	0,55
Total value of production (expressed in days)	€ 3.111,43	
Total value of production (expressed in month)	**€ 93.342,86**	
Production value year		**€ 1.120.114,29**

Tab. 4 Outline description of a 5400 m2 factory:

Description Greenhouse building mt (180 x 30) =5400 sqm	u.m	Size of occupied area
Dedicated area for lettuce cultivation in vertical aeroponics (Greenhouse A) containing 30 double-sided vertical benches of 2 m height (78 x 2 sides by 2 m height = 312 sqm each	Mq	2400 (80 m). X 30 mt.)
Area dedicated to the cultivation of rocket in vertical aeroponics (Greenhouse B) containing 30 double-sided vertical benches of 2 m in height (m 66 x 2 sides by 2 m in height = sq. m 264 each	Mq	2040 (68 m x 30 mt)
Avanserra containing the processing line and cold storage room for bagged finished products	Mq	360 (12 m x 30 mt.)
Technological machine room, sowing line, Germination cell body 6x24= sq m 144, Rooting cell body 6x24= sq m 144, mycorrhization unit and osmosis water treatment plant reverse	Mq	600 (20 m x 30 mt.)

Proceeding to an evaluation of costs such as:
- raw materials for lettuce and rocket production;
- envelope film, packaging and adhesive tape;
- energy used to draw water from the company's well;
- electricity for all utilities in the factory, heating, cooling and CO2;
- commissions;
- transport and the cold chain;
- maintenance;
- policy to insure the factory and representation expenses (such as participation in trade fairs);
- taxes, fees, administrative and tax consultancy, rent for any control software, cleaning costs, postage and telephone costs;
- various services and costs for operating personnel (estimated at 4 employees including 1 administrative manager, 1 greenhouse manager, 1 processing manager and 1 general worker); it was concluded that the expected investment is approximately € 463.00 per square metre for production and subsequent processing into IV range products.

II.2 Study No. 2

After analysing the advantages/disadvantages of the individual production systems, we can evaluate a cost/benefit analysis on two crops grown in greenhouses with *Industrial Aeroponic* Technology: we compare basil production and strawberry production.
We assume the following input data for the construction of a greenhouse structure with a total area of 6,451.20 square metres.
It is divided into :
No. 1 cultivation greenhouse body of 5,644.80 m2
No. 1 warehouse, product processing room and services of 806.40 m2

An aeroponic system with industrial technology will be placed inside the 'venlo' type greenhouse, which, depending on the choice, may vary between a fixed channel system or a mechanised system with mobile channels:
- fixed one-level planting sq.m. 3404.80 gutter (corresponding cultivable area, 60% of the greenhouse area)
- single-level mechanised planting sqm. 4,284.00 (corresponding cultivable area, 76% of the greenhouse area)
- Ortiflex 400 cable ducts.

Tab. 5

Basil production		no. of plants per m2	Plant production year	Total production per year per sqm.
		100	0.6 kg (0.003 kg/day)	60 kg
Type of plant	Number of levels	Cultivated square metres	Annual production kg/sq.m.	Total production kg
Fixed channel	1	3.404,80	60	204.288,00
	2	6.809,60	60	408.576,00
	3	10.214,40	60	612.864,00
Type of plant	Number of levels	Cultivated square metres	Annual production kg/sq.m.	Total production kg
Mobile channel	1	4.284,00	60	257.040,00
	2	8.568,00	60	514.080,00
	3	12.852,00	60	771.120,00

Tab. 6

Strawberry Production		no. of plants per m2	Plant production year	Total production year per sqm.
		100	1.5 kg (0.008 kg/day)	150 kg
Type of plant	Number levels	Cultivated square metres	Annual production kg/sq.m.	Total production kg
Fixed channel	1	3.404,80	150	510.720,00
	2	6.809,60	150	1.021.440,00
	3	10.214,40	150	1.532.160,00
Type of plant	Number levels	Cultivated square metres	Annual production kg/sq.m.	Total production kg
Mobile channel	1	4.284,00	150	642.600,00
	2	8.568,00	150	1.285.200,00
	3	12.852,00	150	1.927.800,00

Tab. 7

Fixed plant cost	Total amount €.
Venlo greenhouse structure	388.000,00
Aeroponic plant 1 level	550.000,00
Aeroponic plant 2 levels	380.000,00
3-level aeroponic system	380.000,00
Mobile plant cost	
Venlo greenhouse structure	388.000,00
Aeroponic plant 1 level	780.000,00
Aeroponic plant 2 levels	380.000,00
3-level aeroponic system	380.000,00

Tab. 8

Mobile plant running costs per year	Total amount €.
1-level management	169.344,00
1+2 level management	254.016,00
1+2+3 level management	338.688,00
heat	22.579,20
electricity 1 level	30.000,00
electricity 1+2 level	33.868,80
electricity 1+2+3 levels	45.158,40
water 1 level	18.100,00
water 1+2 level	27.150,00
water 1+2+3 level	31.700,00
nursery and nursery activity 1 level	28.224,00
nursery and nursist. 1+2 liv.	42.336,00
nursery and viv. att. 1+2+3 liv.	56.448,00

Tab. 9

Fixed plant running costs per year	Total amount €.
1-level management	145.000,00
1+2 level management	188.000,00
1+2+3 level management	250.000,00
heat	33.000,00
electricity 1 level	25.800,00
electricity 1+2 level	37.500,00
electricity 1+2+3 levels	45.150,00
water 1 level	18.100,00
water 1+2 level	27.150,00
water 1+2+3 level	31.700,00
nursery and nursery activity 1 level	28.224,00
nursery and nursist. 1+2 liv.	42.336,00
nursery and viv. att. 1+2+3 liv.	56.448,00

Tab. 10

Operating costs	staff €/month	greenhouse maintenance €/sq.m.	company certification €.	administrative expenses €/month
agronomist	3.000,00	0,35	15.000,00	600,00
agricultural staff	1.700,00			

In conclusion, we make an overall assessment of the investment and make a comparison for strawberry production and basil production in a greenhouse of 5,644.80 square metres plus warehouse, product processing room and services of 806.40 square metres.
Taking into account the costs of raw materials, energy, maintenance, administrative and tax consultancy, management software, various service costs, and operating personnel costs (estimated at 10 employees of which 1 administrative manager, 1 greenhouse manager, 8 general labourers), we see that

In the system with a fixed channel:
The total cost of the installation is approximately €. 150.00 per sqm with 1 level The total cost of the installation is approximately €. 205.00 per sqm with 2 levels The total cost of the installation is approximately €. 265.00 per sqm with 3 levels

In the installation with mobile conduit :
The total cost of the installation is approximately €. 185.00 per sqm with 1 level The total cost of the installation is approximately €. 240.00 per sqm with 2 levels The total cost of the installation is approximately €. 299.00 per sqm with 3 levels

Basil or Strawberry production
In the system with a fixed channel
Total cost of management is approx. € 39.00 per sqm with 1 level
Total cost of management is approx. € 51.00 per sqm with 2 levels
Total cost of management is approx. € 65.00 per sqm with 3 levels

In the system with mobile conduit
Total cost of management is approx. € 42.00 per sqm with 1 level
Total cost of management is approx. € 59.00 per sqm with 2 levels
Total cost of management is approx. € 77.00 per sqm with 3 levels

Therefore, the comparison shows that although the mobile plant has a higher cost of both installation and operation, it allows a larger production area with higher product yields.
Furthermore, not taking into account the cost of the plant, which is a capital asset that will depreciate over n. years, the cost of producing basil is (with a fixed plant) 0.65
0.43 €/kg for the 1-tier plant, 0.43 €/kg for the 2-tier plant and 0.36 €/kg for the 3-tier plant; (with mobile plant) 0.70 €/kg for the 1-tier plant, 0.49 €/kg for the 2-tier plant
levels and 0.43 €/kg for the 3-level planting. For strawberries, the production cost is (with fixed planting) 0.26 €/kg for the 1-level planting, 0.17 €/kg for the 2-level planting and 0.14
€/kg for the 3-level plant; (with mobile plant) of 0.28 €/kg for the 1-level plant, of 0.20
€/kg for the 2-level plant and 0.17 €/kg for the 3-level plant.

Chapter III FIELD GREENHOUSE: COST-BENEFITS ANALYSIS

Traditional greenhouse production:

In order to complete the comparison between traditional greenhouse cultivation and cultivation with aeroponic technology, we proceed with the analysis of a traditional greenhouse by means of tables indicating its installation and management costs and assessing its productivity. The results obtained from this analysis are the fruit of technical workshops carried out during the Agriponic project and data provided by CONFAGRICOLTURA Ragusa.
The greenhouse under consideration is used for the production of basil and has an extension of 1,000 square metres, 700 of which are used for cultivation, the remaining 300 for the passage of labour. Each square metre houses 40/50 basil seedlings, with an annual production of 0.4/0.5 kg per square metre with a total production per square metre of 20/40 kg. The estimated yield is 14,000/28,000 kg total per year for the entire greenhouse.

Tab. 11

Basil production	no. of plants per m2	Plant production year	Total production per year per sqm.
	50	0.4/0.5 kg	20/25 kg
Plant type sqm 1000	Cultivated square metres	Annual production kg/sq.m.	Total production kg
SAU	700	20/25	14.000/17.500

Tab. 12

Operating costs	staff €/month	greenhouse maintenance €/sq.m.	corporate certification €.	administrative expenses €/month
1 sowing and harvesting greenhouse worker	1.352,00	0,15	10.000,00	15,00
No. 1 air conditioning worker and packaging	1.352,00			15,00

Tab. 13

Plant costs	Costs €/sqm	greenhouse maintenance €/sq.m.	administrative expenses greenhouse realisation
Metal-type greenhouse structure - two-year PVC cover	10,00	0,35	2.500,00
Overhead and basal irrigation system with attached fertigation system min.	4,00	0,20	
Annual electricity costs for irrigation system	1.500,00		20,00

Proceeding to an evaluation of annual costs such as:

- gross farm labour costs (the cost of one cultivation worker and one part-time packing and packaging worker is calculated) (€16,404);
- expenses for the fixed installation of the greenhouse structure (€ 10,000);
- maintenance costs (€700.00)
- administrative expenses (€2,500)
- costs of the irrigation system (irrigation water costs are excluded, as the greenhouse has its own water extraction system) (€4,200)
- electricity costs (€ 1,520). This figure refers to the electricity consumed only for water extraction.

It was concluded that the expected initial investment for a 1000 m2 greenhouse ready for production is approximately € 18,920.00 (figure resulting from the sum of greenhouse structure, maintenance costs, administrative costs, irrigation system, and electricity), plus personnel costs, for a total of € 35,324.00.

Tab. 14

Annual revenues	Kg per year produced on 1000 m2 of greenhouse traditional *	Annual average price €/kg *
Basil product on 1000 sqm	14000/18500	1,80/2,00

* Data from Confagricoltura Ragusa

The total revenue for a 1,000 m2 greenhouse with an annual yield of 14,000/18,500 kg varies between € 25,200 and
37,000, and if from this revenue we subtract part of the expenses for the plant (which we can spread over three years) and the expenses for agricultural personnel, in the first three years the result will be that the company, with ups and downs, on average will be able to repay the investment but will not be able to ensure 100% payment of personnel, unless production is over 18,000 kg and the sale of the product is estimated at around 2.00 € per kg. If this is not the case, the business will be at a loss and in the years to follow, having already amortised the costs of the plant, it will have to bear the costs of maintenance, electricity and agricultural personnel, not considering further expenses for inserting innovations or any unforeseen weather conditions; in this case, if we take into account an average production in the values we have estimated, the business would be left with a profit of around 5,000-10,000 euro, from the third year onwards. If part of the farm staff, as is often the case, is the farmer himself, then the profit may even be higher.

CONCLUSIONS

Agriculture is one of the most relevant sectors of the Sicilian and Tunisian economies and plays a fundamental role in the social and economic growth of these two countries. This role is fuelled by the search for development options that can favour this important sector of the economy, for which progressive transformation and evolution are considered of paramount importance in order for this sector to become the engine of the economy of the countries involved in the Agriponic project. Recent studies establish that the population will reach 9 billion in 2050 with the disastrous consequence that resources, per individual, will decrease drastically, especially water resources, without considering the countless damages caused to the environment, due to population growth and the consequent exploitation of the planet's resources. This is why it is necessary to adopt cultivation techniques that are able to meet the demands of the population without causing harmful consequences for the planet.

This paper therefore highlights the importance of the aeroponic technique, seen as a state-of-the-art technique in the agricultural sector and capable of promoting its development and growth, comparing it to traditional cultivation techniques such as greenhouse cultivation. Both from an economic and a production point of view, off-growing techniques, and aeroponics in particular, make it possible to be more competitive since, in line with market needs and demands, they are able to produce a greater quantity of product per unit of cultivated area than traditional techniques, with less use of water resources (around 80% less than the same greenhouse cultivation), less use of fertilisers and the use of pesticides reduced almost to zero. On the other hand, the initial investment for the above-ground cultivation technique may seem large at first glance, but, data in hand, suggests that it is the marketing side that is the most fluctuating, since the quantity and quality of the product are now guaranteed as human risks are minimised and we can say that we are fully in the era of agricultural industrialisation.

The project partners

Lead partner: Municipality
of Ragusa
www.'omune.ragusa.gov.it

URAP Manouba
Manouba Regional Union of Agriculture and Fisheries www.utap.org.tn

Confagricoltura

UPA - Unione Provinciale Agricoltori di Ragusa
www.confagricoltura-sicilia.it

svi.med
centro euromediterraneo
per lo sviluppo sostenibile onlus

SVI.MED. EuroMediterranean Centre for Sustainable Development
www.svimed.eu

£RDA Manouba
Manouba Regional Commissariat for Agricultural Development

Association "Progettiamo Insieme"
Associate Partner

2.2 - FURTHER IMPROVEMENTS TO THE HAGRO-28 MODULE

LOWER COST COMPARISON BETWEEN A TRADITIONAL AGROPONIC SYSTEM AND OUR HAGRO-28 SYSTEM

Average running costs per year	**AGROPONIC SYSTEM TRADITIONAL**	**HAGRO-28**
1st level management	€ 169.344,00	€ 169.344,00
Management 1st+2nd level	€ 254.016,00	€ 254.016,00
Management 1st+2nd+3rd level	€ 338.688,00	€ 338.688,00
Heating	€ 22.579,20	€ 13.547,00
Electricity 1st level	€ 30.000,00	€ 7.500,00
Electricity 1st+2nd level	€ 33.868,80	€ 8.467,20
Electricity 1st+2nd+3rd level	€ 45.158,40	€ 11.289,60
Water 1st level	€ 18.100,00	€ 4.525,00
Water 1st+2nd level	€ 27.150,00	€ 6.787,50
Water 1st+2nd+3rd level	€ 31.700,00	€ 7.925,00
Nursery and nursery activity 1st level	€ 28.224,00	€ 28.224,00
Nursery and nursery activities 1st+2nd level	€ 42.336,00	€ 42.336,00
Nursery and nursery activities 1st+2nd+3rd level	€ 56.448,00	€ 56.448,00

Average fixed plant running costs per year	**AGROPONIC SYSTEM TRADITIONAL**	**HAGRO-28**
1st level management	€ 145.000,00	€ 145.000,00
Management 1st+2nd level	€ 188.000,00	€ 188.000,00
Management 1st+2nd+3rd level	€ 250.000,00	€ 250.000,00
Heating	€ 33.000,00	€ 19.800,00
Electricity 1st level	€ 25.800,00	€ 6.450,00
Electricity 1st+2nd level	€ 37.500,00	€ 9.375,00
Electricity 1st+2nd+3rd level	€ 45.150,00	€ 11.287,50
Water 1st level	€ 18.100,00	€ 4.525,00
Water 1st+2nd level	€ 27.150,00	€ 6.787,50
Water 1st+2nd+3rd level	€ 31.700,00	€ 9.925,00
Nursery and nursery activity 1st level	€ 28.224,00	€ 28.224,00
Nursery and nursery activities 1st+2nd level	€ 42.336,00	€ 42.336,00
Nursery and nursery activities 1st+2nd+3rd level	€ 56.448,00	€ 56.448,00

2.3 - EXAMPLE BP FOR A CONTAINER OF HAGRO-28 LETTUCE

Synthesis

Before giving an overall idea of the HAGRO28 project presented here and its IP, based on the studies carried out on production costs - revenues in the previous chapters, in the present section we will formulate a BP in relation to a single container of aeroponic cultivation, first of all envisaging the contextualisation of production in the Italian market.

With the desire to give a comprehensive picture, we also thought to give a contextualisation to BP based on existing market research and the potential identified for agricultural enterprises in the Italian market.

Considering the market analysis, we believe that the Italian market will function as an attractive option for agricultural enterprises as it has a higher demand for organic production and agricultural products, including vegetables.

Market competition is also high, but higher demand is a positive indicator for new start-ups to capture market potential while acquiring sustainable profitability trends.

Using NFT technology we will monitor production activities to reduce the use of unnecessary resources and achieve the production efficiency targets of the selected 28-day production cycle

The use of energy and environmental technology will enable performance unattainable by any competitor in the industry.

In the following paragraphs, considering the contextualisation of the Italian market as true and stringent compared to other European markets, we will then consider the unitary BP of the container studied as the basis for drawing up the overall IP.

.

Overview

According to the business plan, we will purchase containers to start organic fruit and vegetable production in environmentally friendly settings. We will install appropriate automation and monitoring systems to manage the inventory and production process through advanced cloud-based databases and state-of-the-art software. The business idea will be entirely based on the aeroponic farming system, which is explained in detail below and utilises advanced technologies for the supply of energy and water carriers.

Aeroponic farming

We plan to use an aeroponic farming system, which is an advanced system for growing crops. This technique is an efficient and relatively better technique for growing crops where there are obvious land space problems and weather conditions are not suitable for farming. AEROPONIC systems allow for seasonally adjusted, double and faster production systems. Following our plan, this system will work efficiently to adapt to adverse weather conditions and land problems (e.g. space problems, weeds and pollution). Being an environmentally friendly system, it will provide us with high production capacity with minimal waste and environmental impact. The non-use of pesticides is an added value that allows us to cultivate organic crops using cost-effective methods (minimising the use of resources such as water and soil resources). The basic principle of this method is the suspension of plants in a closed or semi-closed environment. We plan to use containers. The plants will be placed in suspension while we spray the dangling roots and lower stems of the plants with a nutrient-rich aqueous solution in an atomised water supply system. This automation will help us to reduce the use of labour . In addition, the trellis will be used for plants with fruit and vegetables to properly support the weight and reduce the possibility of breakage.

Agricultural Aeroponic Activities in Europe

Aeroponic farming is becoming an attractive investment option for farms and private investors in remote areas. According to market statistics, the global market value reported in 2018 was about € 578 million in 2018. Considering a CAGR of 25.60%, it will reach about € 3.53 billion until 2026. Somehow, the reported CAGR for European countries is about 28.8%, which is expected to grow with constant trends also after 2026. Based on market statistics, we estimate that the AEROPONIC agricultural system will have a market value of more than millions of Euros in the coming years.

Critical analysis of aeroponic farming

Compared to the traditional farming system, the AEROPONIC farming system has multiple advantages that make it an attractive option in developed countries. In contrast to traditional cropping and farming systems, the AEROPONIC farming system has advantages in terms of cost, high potential for efficient resource utilisation, improved production capacity and minimal environmental impact in the form of pollution. The traditional farming system presents various threats and challenges to sustainability in terms of production efficiency and profitability. We can consider the AEROPONIC farming system as a technique designed for the cultivation of greenhouse crops in the complete absence of soil, which is a primary element for the traditional farming system. Empirical research studies and market reports indicate the following key advantages of the AEROPONIC farming system over the traditional farming system.

- Chemical-free cultivation, avoiding the unnecessary use of pesticides.
- Less pollution
- Cost-effective techniques with high production efficiency
- Management of meteorological effects

Comparative analysis with traditional production

The AEROPONIC farming system promises an estimated yield of 70% to 200% over the traditional farming system. Although an AEROPONIC farming system, properly managed with advanced technology and NFT software-based monitoring, can increase this yield by up to 1000%.

In terms of production, we can compare both methods in the following advantages and disadvantages:

	Traditional Method	Aeroponic Method
Advantages	▪ Traditional harvesting method ▪ Useful for highly productive soils and soils with high fertility levels ▪ Finding labour is easy ▪ Well thought-out agricultural system ▪ Perfect for poor countries with limited automation facilities and skilled labour ▪ Suitable for small local farms ▪ Natural flavours and taste ▪ System of natural and designed water supply with rich nutrients from the soil	▪ Intensive production system ▪ Maintaining high production capacity in unfavourable climatic zones ▪ Fully mechanised production ▪ Production crop by overcoming difficulties with reduced soil fertility ▪ Possibility of using the entire volume of the greenhouse ▪ Expansion of collection calendars ▪ Parameters for maintaining nutrient solutions
Disadvantages	▪ Requires the use of pesticides to prevent plant diseases ▪ Excessive wastage due to crop damage ▪ Not suitable for areas with extreme weather conditions ▪ Not suitable for areas with fertility problems	▪ The high start-up cost of installing efficient production systems ▪ Computerised production control requires good professionalism and competence of operators

Cost comparisons

The costs associated with the traditional and AEROPONIC production system can be classified as follows

Traditional

- Land
- Pesticides
- Weather protection measures
- Installation of the water supply system
- Staff (farmers)

Aeroponic

- Container
- Control software
- Specialised personnel

Comparatively, the high production efficiency, efficient use of resources and savings in chemical costs make the AEROPONIC farming system relatively cost-effective and low-cost, compared to the traditional farming system. Although the **one-off** start-up cost of the AEROPONIC control system can sometimes be higher than the traditional farming system. To some extent, it depends entirely on the areas selected and the availability of resources. In technology-friendly countries, automated AEROPONIC systems require a lower start-up cost than the traditional method. Somehow, countries with a high market value for land make the traditional method relatively expensive.

Economic benefits and financial expectations

This cultivation system can bring several advantages over hydroponics on substrate. The absence of a substrate provides an economic advantage to growers by eliminating the need to purchase or dispose of growbags for container-grown crops. It also facilitates the reuse of excess solution, promoting a 'closed loop' approach that leads to **substantial savings in water and nutrient consumption**. This, in turn, reduces the overall cost of production and makes the aeroponic method profitable compared to the traditional method. In addition, it contributes to increasing the domestic agricultural market in those economies that depend on imports due to problems such as low soil fertility, unfavourable weather conditions or unavailability of suitable soil for a specific crop.

I. Investment Benefits

Qualitativ

In addition to saving water, soil and time, the absence of fertilisers and pesticides ensures that the products are incredibly safe, regulated, healthy, nutritious and of excellent quality. 100% organic.

Quantities

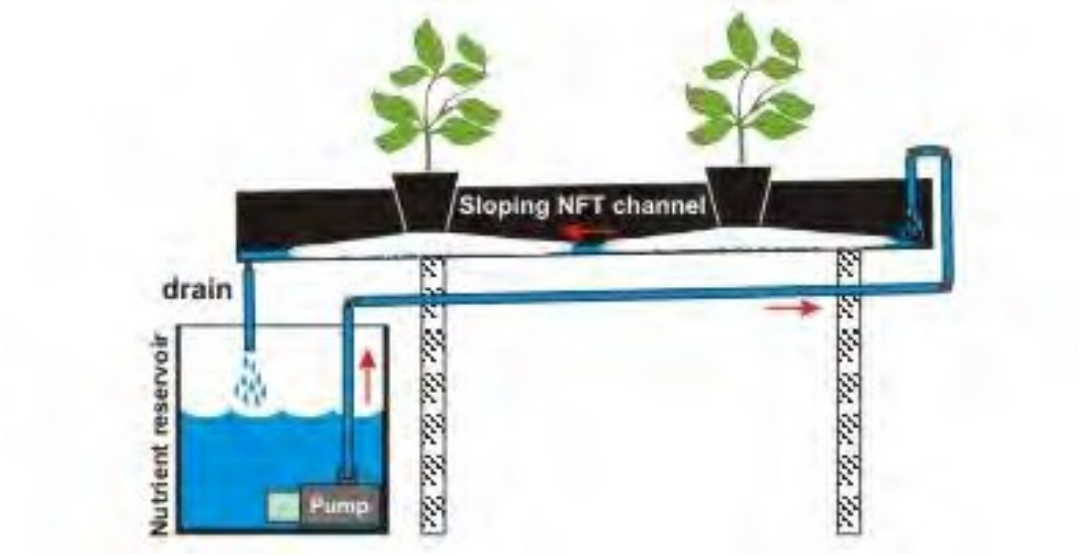
The HAGRO method guarantees a 1000% increase in yield per hectare, compared to conventional agriculture. It also reduces soil and water consumption by more than 70%.

Time

With the help of constant, natural fertilisers, balanced by specialised NFT cloud software, the production cycle lasts an average of 28 days, with multiple repetitions throughout the year.

Technology

According to the business plan, we will use a central system to align all plants with the NFT software. Using this software, we will monitor all plants during the growth and cultivation process. This software will also allow us to maintain nutrient supply systems at different stages of the growth cycle (the average production cycle for each plant will last about 28 days). In addition, the cloud-based software will help us with source and inventory management. Using advanced algorithms and available data (crop database), we will set optimal inventory levels to avoid waste and unnecessary production costs.



Energy & Efficiency

As presented in the previous chapters, all production will be equipped with a high-efficiency air filtration system, an air-water recovery system, and an energy production system with storage that will produce an overall resource consumption of several 25% of traditional cultivation requirements. The BP therefore foresees such lower consumption resulting in higher productivity and overall economic performance.

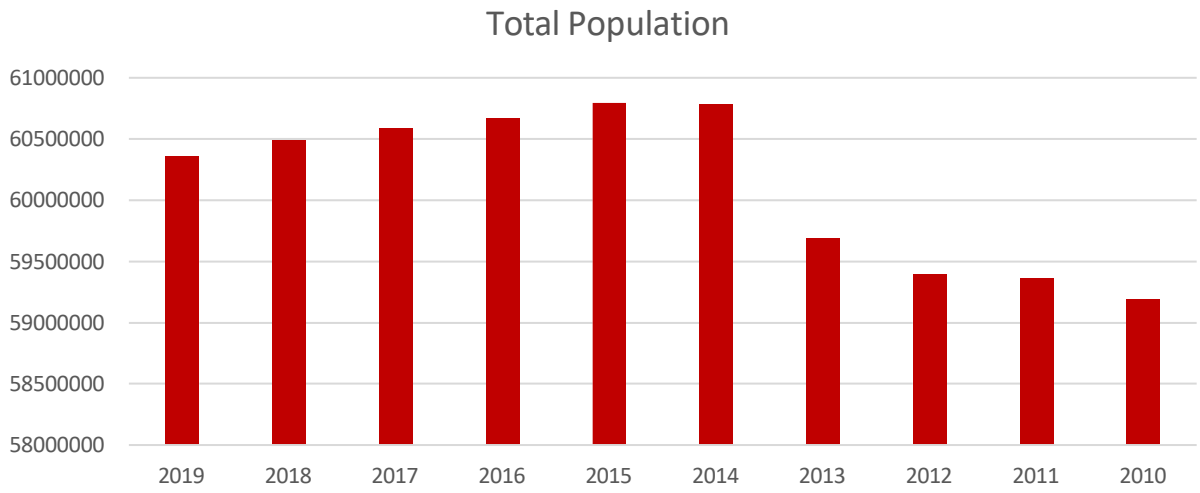
Market Context

Political situation

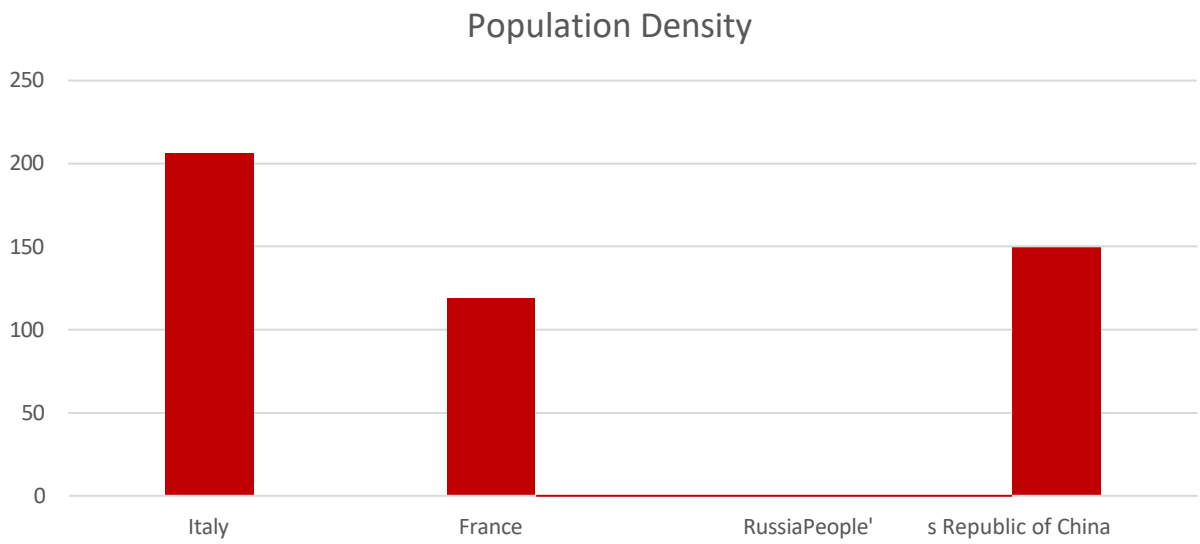
According to the market analysis, the political situation in Italy is favourable to start-ups and enterprises. The Italian government assists small companies with good financial and fiscal leverage. The general political situation in the country is somewhat unstable, which increases the risk for small companies interested in international trade and other business activities that remain sensitive to the political situation. As far as agricultural activities are concerned, the Italian government is assisting small organisations and farmers by facilitating them, which has attracted the attention of private investors in agricultural enterprises and agriculture.

Social situation

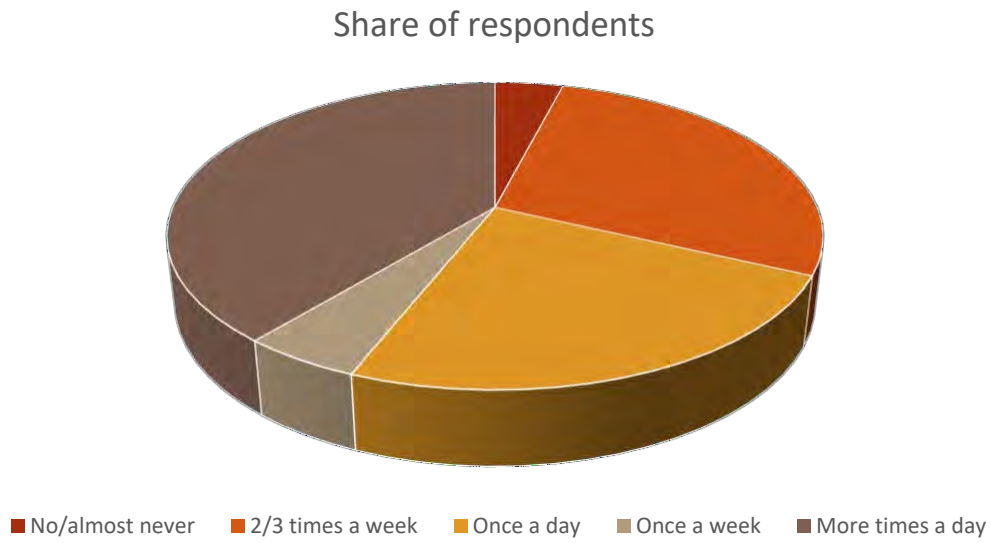
According to our market research, Italy is an ideal market for agricultural companies. Italy has a population of more than 59 million (2021). The population is growing rapidly and could reach 60 million in a few years. This high growth is also supported by immigrants and temporary residents from other countries. The population growth trend is a positive indicator for agricultural enterprises, as it represents the growing demand for food products.



According to the World Health Organisation, Italy has a relatively higher population density than France and Russia. Consequently, the market value of land is beyond the reach of small entrepreneurs interested in agriculture. However, the Italian market is ideal for farming due to the high demand for vegetables and fruit.



According to market research, more than 40% of the total Italian population consumes vegetables more than once a day. However, the total agricultural land devoted to different



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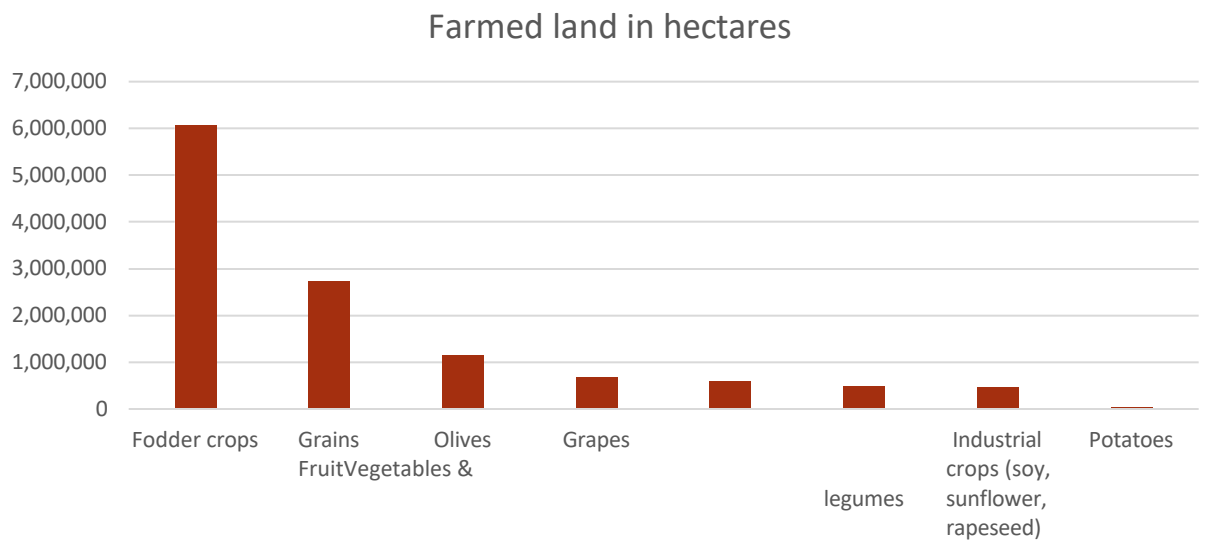
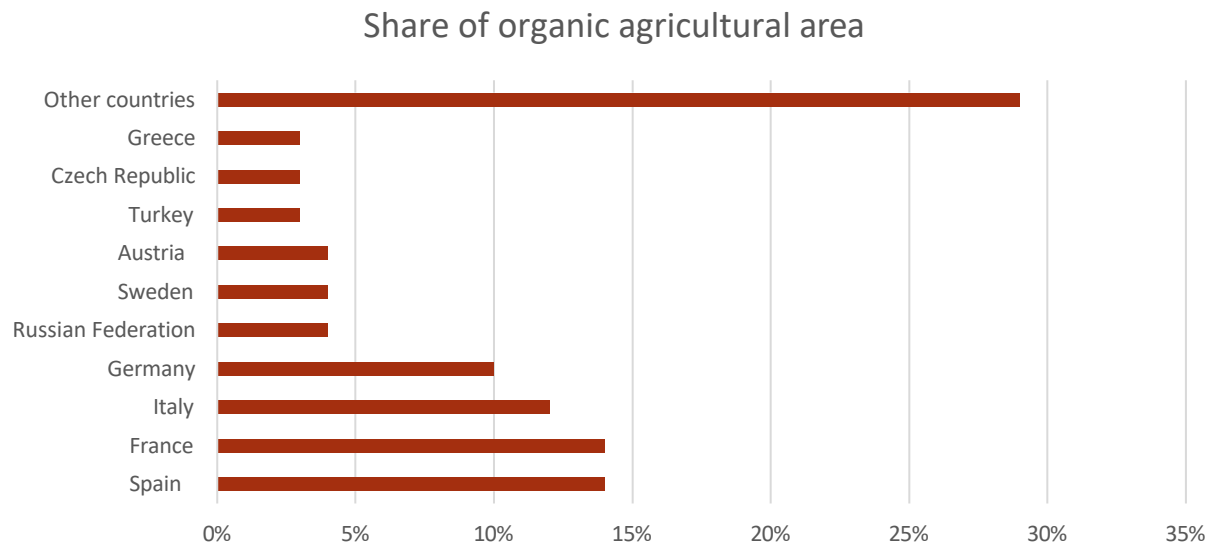
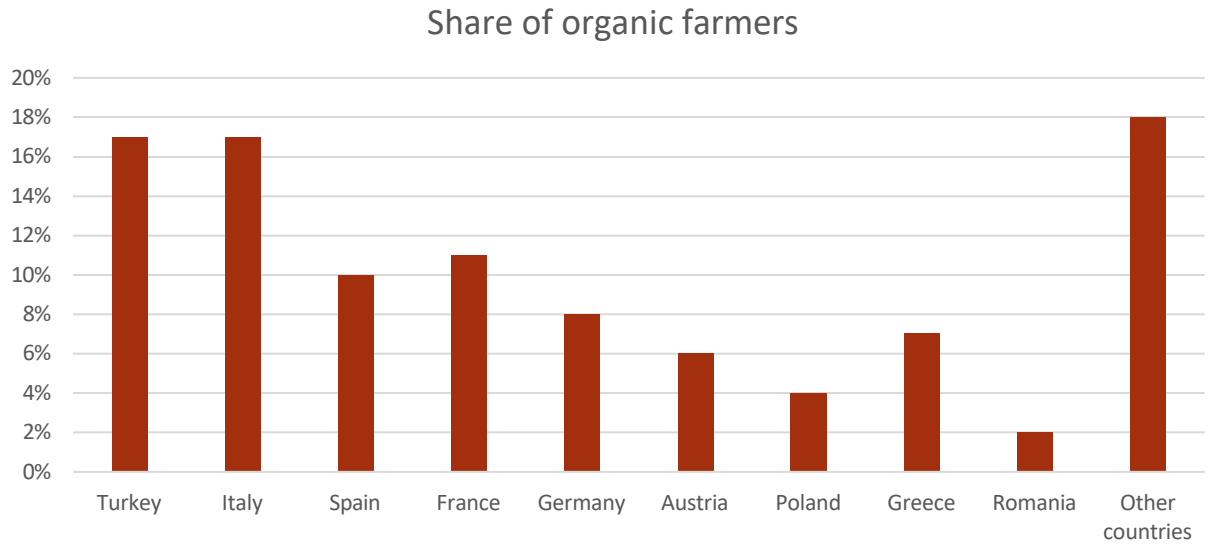
Considering these market results, we can see that less than 1,000,000 hectares of agricultural land are dedicated to vegetables and pulses. One of the main reasons for this is the increasing tendency to produce efficiently in containers and greenhouses.

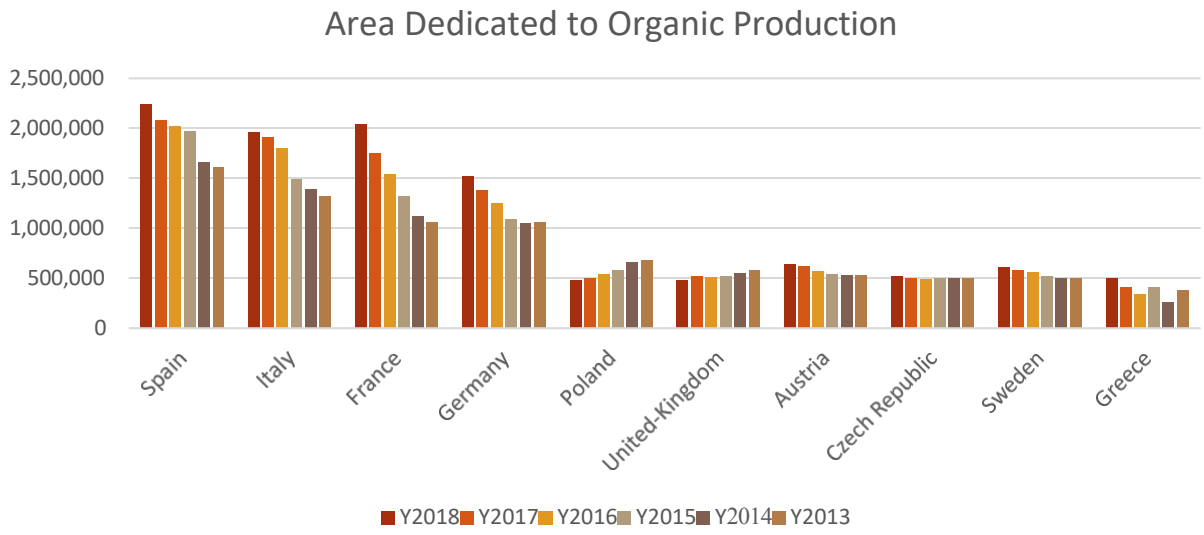


Market research indicates that Italy is among the top countries in the world with a higher share of organic agricultural land. In Italy, the share of organic agricultural area is about 15%. The market share is equally distributed and shared by several organic farmers. Compared to other countries, Italy has about 17% of the organic farming market share, which is the second highest.

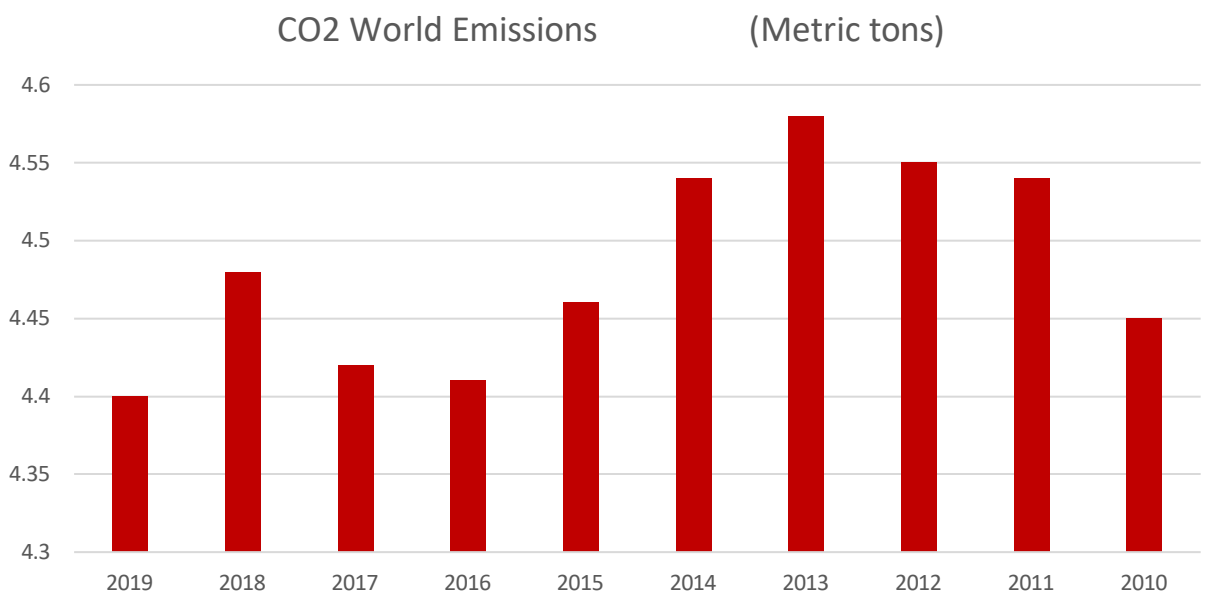




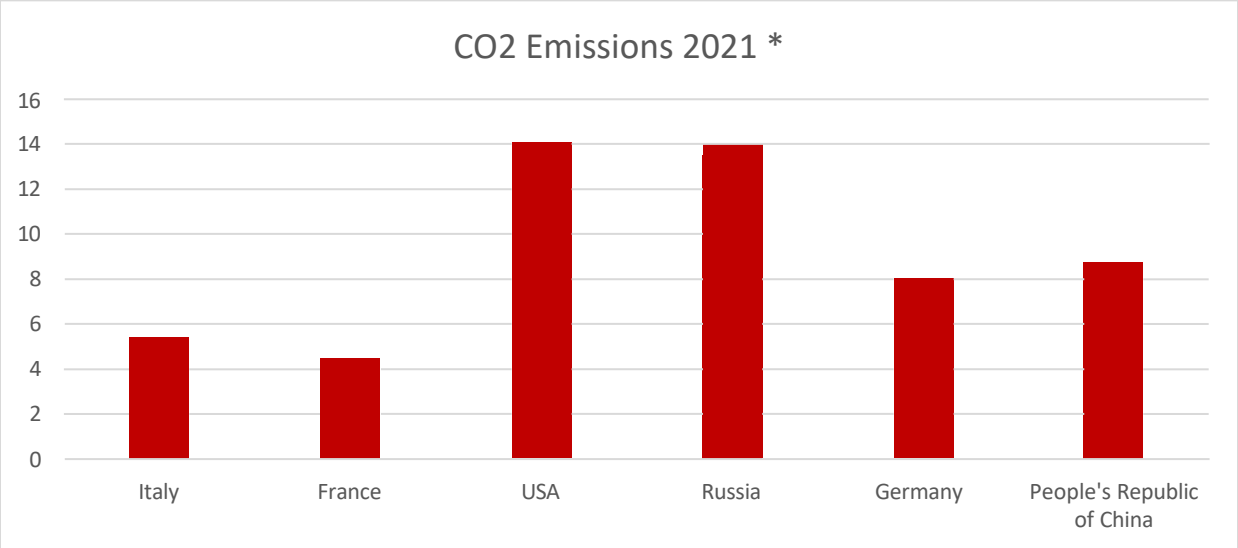
Italy is an ideal country with high demand for organic products and vegetables and ranks among the top countries with the largest area dedicated to organic production. Market research indicates that Italy is not an ideal market for our business due to high demand, but it also presents new trends for organic production and organic farming systems. In this situation, investments in this sector can be fruitful in terms of high profitability growth rates.



Although agriculture is growing in Italy, some environmental issues are still important for farmers and we also have to take this into account when implementing our business plan in the Italian market. In recent years, the Italian government and investors in agricultural systems have succeeded in minimising carbon dioxide emissions into the environment.



Italy has lowered its carbon footprint scores. The goal of the industrial sector and agricultural companies is to achieve 0% CO2 emissions. Our business plan is to work on agricultural products while keeping CO2 emissions to a minimum. In this situation, our idea of using low-carbon containers and pollution-controlled production will allow us to contribute to the well-being of the planet.



Economic situation

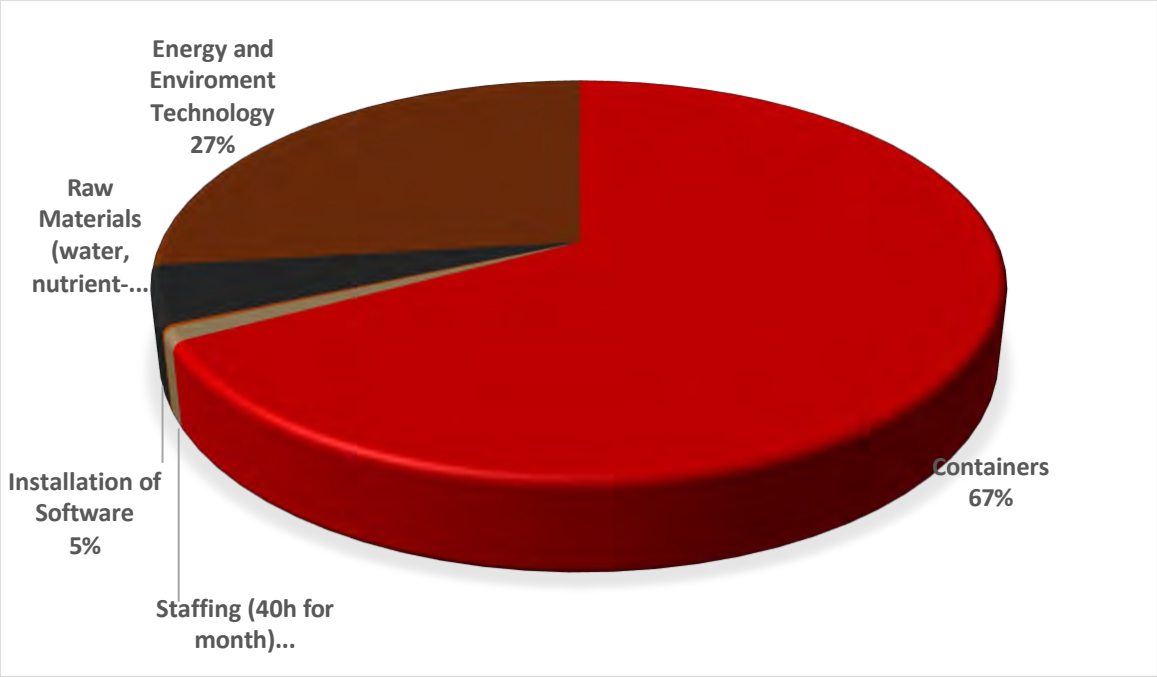
Italy's current economic situation is ideal for small businesses and large companies. The growth in GDP and average income per capita indicates the high affordability of Italian residents. All major inflation rates have a limited impact on our business. Our business will offer food products that fall into the category of basic necessities, with minimal impact on consumer purchasing behaviour.

Regulations

3. According to government reports, Italy is among the leading exporters of agricultural products. In 2021 alone, Italy exported $6.5 billion worth of agricultural products. Although agricultural companies involved in international trade must comply with local laws and other obligations specified by the Italian government. We expect to comply with the following laws and regulations:
4. Appropriate tax payments for each category: personal income tax, value added tax and corporate income tax.
5. Comply with the environmental protection laws and regulations imposed by the Italian government regarding the control of CO2 emissions.
6. According to the 2016 Stability Law, our company will be exempt from paying the regional business tax and the municipal property tax...

HAGRO-28 single container cost

Start-up Expenses Needed		
Function Title	**Cost**	
Containers (All Inclusive)	€	100.000,00
Staffing (40h per month) x 2	€	1.600,00
Raw Materials (water, nutrient-rich water solution)	€	350,00
Installation of Software	€	7.000,00
Marketing	€	1.050,00
Energy and Enviroment Technology	€	40.000,00
Total	**€**	**150.000,00**



BP in case of HAGRO-28 investment (we will own the project containers)

Income Statement of 1 HAGRO-28 container					
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Operating Revenue					
Revenue Lettuce Plants	129.600,00 €	133.488,00 €	140.162,40 €	149.973,76 €	164.997,00 €
Sales Return	- €	- €	- €	- €	- €
Net sales revenue	129.600,00 €	133.488,00 €	140.162,40 €	149.973,76 €	164.997,00 €
Direct labour	1.451,20 €	1.528,20 €	1.605,32 €	1.682,34 €	1.759,20 €
Ader work cost	- €	- €	- €	- €	- €
COGS	8.885,00 €	9.462,16 €	10.989,63 €	12.274,22 €	13.998,64 €
Gross profit	119.263,80 €	122.497,64 €	127.567,45 €	136.017,20 €	149.239,16 €
Operating expenses					
Rent expenses	- €	- €	- €	- €	- €
Selling and administrative expenses	950,00 €	969,00 €	1.002,92 €	1.053,06 €	1.132,04 €
Utilities	421,00 €	429,42 €	444,45 €	466,67 €	501,67 €
Transportation and other expenses	- €	- €	- €	- €	- €
Total operating expenses	1.371,00 €	1.398,42 €	1.447,37 €	1.519,73 €	1.633,71 €
EBITDA	117.892,80 €	121.099,22 €	126.120,08 €	134.497,47 €	147.605,45 €
Depreciation expenses	30.000,00 €	30.000,00 €	30.000,00 €	30.000,00 €	30.000,00 €
EBIT	87.892,80 €	91.099,22 €	96.120,08 €	104.497,47 €	117.605,45 €
Interest expenses	10.500,00 €	8.400,00 €	6.300,00 €	4.200,00 €	2.100,00 €
Earnings before incoming TAX	77.392,80 €	82.699,22 €	89.820,08 €	100.297,47 €	115.505,45 €
Income TAX	11.608,92 €	12.404,88 €	13.473,01 €	15.044,62 €	17.325,82 €
Net income	65.783,88 €	70.294,34 €	76.347,07 €	85.252,85 €	98.179,63 €

Projected Balance Sheet					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Balance Sheet					
Assets					
Current Assets					
Cash	158.546,92 €	185.909,32 €	215.980,06 €	249.552,90 €	287.941,74 €
Accounts Receivables	460,78 €	474,60 €	498,33 €	533,21 €	586,53 €
Raw Materials	- €	- €	- €	- €	- €
Office Supplies	100,00 €	100,00 €	100,00 €	100,00 €	100,00 €
Other Current Assets	350,00 €	350,00 €	350,00 €	350,00 €	350,00 €
Total Current Assets	159.457,70 €	186.833,92 €	216.928,40 €	250.536,11 €	288.978,27 €
PP&E	100.000,00 €	100.000,00 €	70.000,00 €	70.000,00 €	70.000,00 €
Land	- €	- €	- €	- €	- €
Furniture	- €	- €	- €	- €	- €
Vehicles	- €	- €	- €	- €	- €
Other Long term Assets	5.000,00 €	5.000,00 €	5.000,00 €	5.000,00 €	5.000,00 €
Total Long term Assets	105.000,00 €	105.000,00 €	75.000,00 €	75.000,00 €	75.000,00 €
Total Assets	264.457,70 €	291.833,92 €	291.928,40 €	325.536,11 €	363.978,27 €
Current Liabilities					
Accounts Payable	- €	- €	- €	- €	- €
Salary Expense Payable	1.200,00 €	1.200,00 €	1.200,00 €	1.200,00 €	1.200,00 €
Office Rent Payable	- €	- €	- €	- €	- €
Furniture (Credit Purchase)	- €	- €	- €	- €	- €
Other short term payments	200,00 €	200,00 €	200,00 €	200,00 €	200,00 €
Total Current Liabilities	1.400,00 €	1.400,00 €	1.400,00 €	1.400,00 €	1.400,00 €
Non-current Liabilities					
Notes Payable	1.000,00 €	1.000,00 €	560,00 €	760,00 €	1.000,00 €
Loan	100.000,00 €	90.000,00 €	80.000,00 €	70.000,00 €	60.000,00 €
Total non-current liabilities	101.000,00 €	91.000,00 €	80.560,00 €	70.760,00 €	61.000,00 €
Total Liability	102.400,00 €	92.400,00 €	81.960,00 €	72.160,00 €	62.400,00 €
Total Capital	159.817,61 €	329.438,62 €	389.744,86 €	456.391,02 €	532.675,47 €
Total Liability & Capital	262.217,61 €	421.838,62 €	471.704,86 €	528.551,02 €	595.075,47 €

CAP. 3

DRAFT AND BP

Project Summary

THE HAGRO28 project is not only conceived as an agricultural project, but as an integrated project with multiple economic and social implications.

The HAGRO28 project therefore includes the production and sale of aeroponic crops, but also the simultaneous dissemination of a new agricultural culture.

The objectives we aim to achieve with this project are twofold:

1. The industrialisation of container and component production
2. The creation of 'farms' in industrial or densely populated city contexts involving the spread of a new organic farming culture

In relation to the first point, in order to have an industrialisation of products and processes, we estimate that in the initial phase we will need to produce the first 2,000 containers; after this production, the cost of industrialised containers can be lowered from the current 150kEuro/container to 120kEuro/container, making the product highly performing and interesting for the final market.

In relation to the second point, in our opinion the most interesting, we thought of the industrialisation phase of the product, i.e. the production of 2,000 containers, jointly as an opportunity to build real farms that spread a new agricultural culture.

In particular, it is planned to set up a series of farms in closed environments, taking over industrial or large city brownfield sites and placing the crops in built environments.

A final note to tell you that the project also provides for the dissemination of an educational and social culture; it is envisaged that 5 per cent of the production of aeroponic crops will then be allocated to associations and the poor in the vicinity of the farm.

Our idea is therefore to industrialise a product, but also to give a new ethical, social version of agriculture, as well as opportunities to remunerate the agricultural market in conjunction with a new reconversion of brownfield sites.

On the following pages, we will give more detail about the project and the IP.

HAGRO28

Notes on some components of the plan

Costs Setting up farms

As mentioned above, HAGRO28 envisages the simultaneous industrialisation of the product and the construction of farms installing a total of 2,000 containers at various sites across Africa.

The plan is to build eight farms, each located in a different African country. In particular,

we plan to build the following farms:

LOCATION FARM	CONTAINER / FARM	SQM BUILDING OR SURFACE
MOROCCO	300	10.000
SENEGAL	300	10.000
EGIPT	300	10.000
ALGERY	200	7.500
CAMERUN	300	10.000
KENYA	300	10.000
ETIOPIA	200	7.500
TUNISIA	100	5.000
TOT.	**2.000**	**70.000**

Costs Setting up farms

As predicted and extensively described in Chapter 2, a container costs a total of about 150k Euro/container. In addition to the cost of the containers, there are also the costs for the purchase of the farms (areas and buildings) and their renovation. The market cost for a turnkey building of this type, average for the countries envisaged, can be estimated today at 1400Euro/sqm.

The sum of container and farm costs results in the total investment cost, which we detail below.

- Overall, the planned investment in farms for the technology part alone is as follows:

150K Euro / container x 2,000 Containers = 300M Euro

- Cost of farm purchase and renovation:

1400Euro / sqm x 70,000 mp = 98M Euro

In total, therefore, the project requires a resource of 398MEuros.

It is also emphasised that the project is perfectly modulable; if you do not wish to finance the project in full, you can give us an indication of the number of containers or the farm limit you wish to finance and the project will be remodelled accordingly.

Research and Development

The HAGRO28 project wants to be a technological vanguard today and remain so in the future.
In this direction, we have foreseen that the sum of
1,000,000 Euro / year.

The research will address all of HAGRO 28's constituent components, including environmental, agronomic and technological ones.

As of the second year, this sum will be allocated. This sum will also be used for training, dissemination of events and scientific publications. Also envisaged in this sum is the drafting of an agreement with a training institute in each city in which the farm will be located, in order to integrate training and research.

Ethical contextualisation

As presented above, the project plans to allocate part of the proceeds to local societies.

As you will see from the BP; we therefore plan to allocate 5% of production in this direction. We are confident that this will result in the farms becoming real centres of aggregation and dissemination of an evolved conscious culture.

Personnel costs

The HAGRO28 project envisages the employment of personnel in each farm. In fact, each farm will become the technical commercial reference for the individual country in which it is located.

The desire is to create, for each country identified, commercial, assistance, technical and operational policies that are in line with the desiderata of the country on which it is based. Therefore, the will is that of a standardised project, but one that is also inserted in the environment and ready to incorporate the social, technical, economic and production needs of the reference context.

The profiles will be various and of varying cost.

Below are the estimated total costs for personnel, which we have divided into two macro-categories: Administrative Technical and Bording, Operational Training Assistance.

Technical-administrative staff cost and bording

A minimum of 8 persons / location x 8 locations x 90,000Euro average / person is expected to be employed.

The total estimated annual cost is therefore EUR 5,120,000.

Cost of Operational Personnel Assistance and Training

A minimum of 100 people of various profiles and skills are expected to be recruited at a cost (including travel) of

The total estimated annual cost is therefore 7,000,000Euro.

HAGRO28

Industrial Plan

Industrial Plan

Income Statement 6 Year						
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
Operating Revenue						
Revenue of Plants	- €	266.976.000,00 €	280.324.800,00 €	299.947.520,00 €	329.994.000,00 €	361.784.000,00 €
Sales Return	- €	- €	- €	- €	- €	- €
Net sales revenue	- €	266.976.000,00 €	280.324.800,00 €	299.947.520,00 €	329.994.000,00 €	361.784.000,00 €
Cost of building container	150.000.000,00 €	150.000.000,00 €	- €	- €	- €	- €
Direct labor	- €	5.250.000,00 €	7.000.000,00 €	7.000.000,00 €	7.000.000,00 €	7.000.000,00 €
Ader lavor cost	- €	- €	- €	- €	- €	- €
Research and development	1.000.000,00 €	1.000.000,00 €	1.000.000,00 €	1.000.000,00 €	1.000.000,00 €	1.000.000,00 €
COGS	- €	11.827.700,00 €	21.979.260,00 €	24.548.440,00 €	27.997.280,00 €	30.900.000,00 €
Gross profit	- 151.000.000,00 €	249.898.300,00 €	251.345.540,00 €	268.399.080,00 €	294.996.720,00 €	323.884.000,00 €
Operating expenses						
Rent expenses	- €	- €	- €	- €	- €	- €
Selling and administrative expenses	512.000,00 €	4.120.000,00 €	5.120.000,00 €	5.120.000,00 €	5.120.000,00 €	5.120.000,00 €
Sales agents and marketing	- €	5.339.520,00 €	5.606.496,00 €	5.998.950,40 €	6.599.880,00 €	7.235.680,00 €
Utilities	- €	2.500.000,00 €	3.000.000,00 €	3.000.000,00 €	3.000.000,00 €	3.000.000,00 €
Insurance	- €	5.339.520,00 €	5.606.496,00 €	5.998.950,40 €	6.599.880,00 €	7.235.680,00 €
Transportation and other expenses	- €	8.009.280,00 €	8.409.744,00 €	8.998.425,60 €	9.899.820,00 €	10.853.520,00 €
Total operating expenses	512.000,00 €	25.308.320,00 €	27.742.736,00 €	29.116.326,40 €	31.219.580,00 €	33.444.880,00 €
EBITDA	- 151.512.000,00 €	224.589.980,00 €	223.602.804,00 €	239.282.753,60 €	263.777.140,00 €	290.439.120,00 €
Depreciation expenses	- €	45.000.000,00 €	60.000.000,00 €	60.000.000,00 €	60.000.000,00 €	60.000.000,00 €
EBIT	- 151.512.000,00 €	179.589.980,00 €	163.602.804,00 €	179.282.753,60 €	203.777.140,00 €	230.439.120,00 €
Interest expenses	- €	15.750.000,00 €	21.000.000,00 €	12.600.000,00 €	8.400.000,00 €	5.600.000,00 €
Earnings before incoming TAX	- 151.512.000,00 €	163.839.980,00 €	142.602.804,00 €	166.682.753,60 €	195.377.140,00 €	224.839.120,00 €
Social Donation		8.191.999,00 €	7.130.140,20 €	8.334.137,68 €	9.768.857,00 €	11.241.956,00 €
Income TAX	- €	24.575.997,00 €	21.390.420,60 €	25.002.413,04 €	29.306.571,00 €	33.725.868,00 €
Net income	- 151.512.000,00 €	139.263.983,00 €	121.212.383,40 €	141.680.340,56 €	166.070.569,00 €	191.113.252,00 €

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