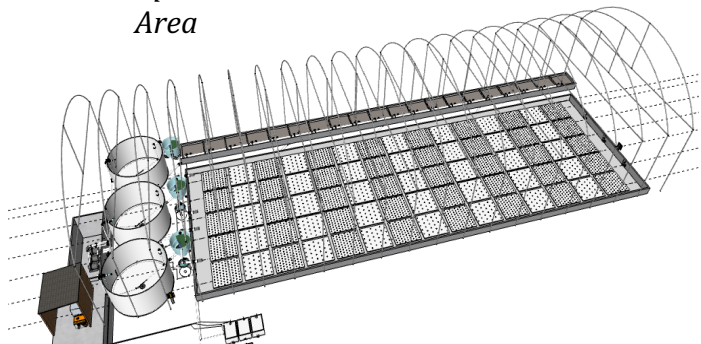


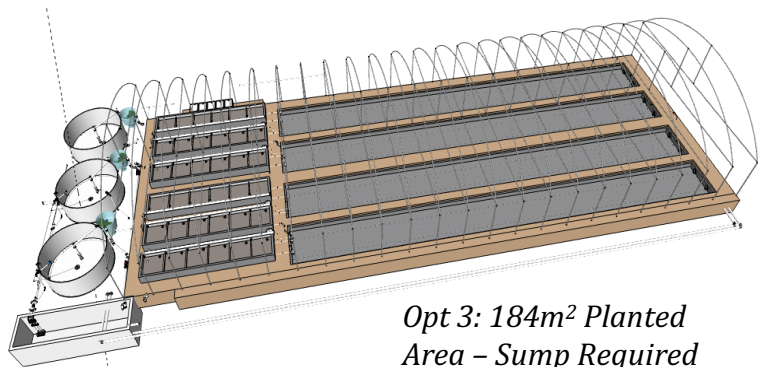
Ichthys Specialised Designs 300m² Professional Aquaponic System

"Success starts with the best aquaponics system design"

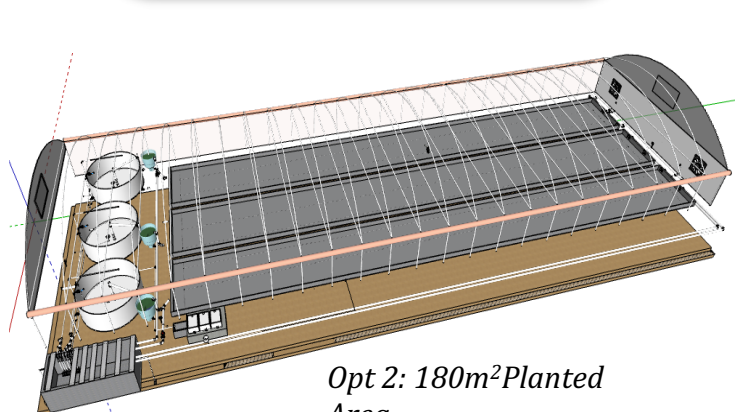
Opt 4: 182m² Planted Area



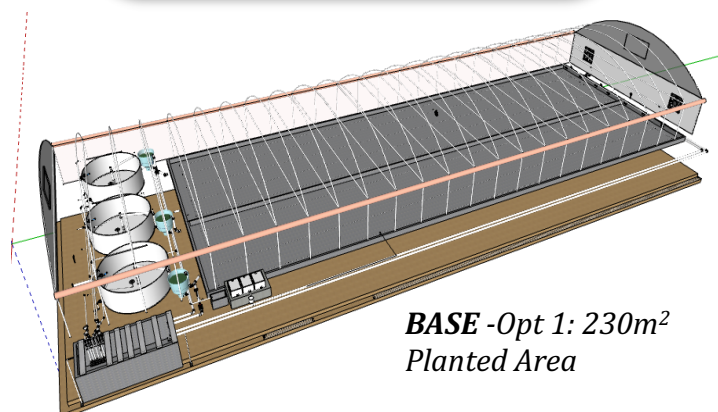
Opt 3: 184m² Planted Area – Sump Required



Opt 2: 180m² Planted Area



BASE -Opt 1: 230m² Planted Area



1. High Level System Summary – Professional Aquaponics System

SYSTEM AQUACULTURE PERFORMANCE			
Total Tank Volume	25’800lt		
Water change cycle	Standard System -2hourly		
Aeration	Standard System Air – 10lt/min per 1000lt tank size		
	2000 above Sea level (i.e. Jhb)		
Theoretical Stocking Density	774kg (30kg/1000lt)		
	Tilapia Niloticus Monthly Harvest Estimate (Sea-level, 21-25°C)		
Act. Density–100%	376 kg/month		
Act. Density–80%	300 kg/month		
Act. SD –60%	225 kg/month		
Act. SD–40%	150 kg/month		
SYSTEM HYDROPONIC PERFORMANCE			
Hydroponics Grow Area	Total	Media Beds	DWC/Float Beds
1. DWC Full	230m²	-	230m
2. DWC-Three Tier	180m²	-	180m²
3. DWC-Media Hybrid	198-186m²	3.1) 40m² or 3.2) 68m²	3.1) 158m² or 3.2)118m²
4. Media Full	204m²	204m²	
# of Plants	# of Plants (20cm Spacing)	Estimate yields per month - Frilly lettuce	Estimate Yields per month – Basil
	4’500 - 5’750	4’850 - 6’200 heads	325-414kg
TECHNICAL PERFORMANCE			
Ave. Power Consumption	0.6 – 0.66kW/hr		
Materials CAPEX Standard Tunnel- per m2	R1’066 materials per m² (Buy the entire system and qualify for up to 20% discount)		
CAPEX – Fully built outsourced to Ichthys	R1’594 materials per m² (T&C’s apply, excludes accommodation, per diem, traveling fees)		

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About the Ichthys Professional Series -300m²

The professional series is a range of proven aquaponics system's, designed for average to optimal revenue generation relative to capital investment and space. The superior performing design enables for intensive farming and maximize your hydroponic and aquaculture yields. It utilizes proven commercial hydroponics systems (Gravel media, DWC, Wicking, and Vertical aeroponics), designed based on all aquaculture and hydroponic best practices.

Capital cost to Yield Comparison

Planting efficiency ratio is rated at 60-77% and above, which provides you with maximum utilization to plant relative to the overall system area. The specification of the aquaculture system is designed with a commercial "hydroponic area-tank ratio" of 6:1 and 9:1 depending system selected.

Do note that farming in general can be unpredictable and an aquaponics system can take 6 months to a year until it is operating at maximum production. Numbers are indicative.

System Overview

This system is in an agricultural greenhouse structure (30m x 10m) that house both the hydroponics and aquaculture, to ensure a more stable environment.

Optional Extra's:

A commercial aquaponics eco-system consists of an integrated combination of macro and micro systems, working symbiotically together to provide high performance natural growing eco-system. We do recommend and offer all minor systems and support systems at an additional cost. Related pricing and bill of materials are provided in respective overviews on the optional extras document.

2. System Specifics

Hydroponic Greenhouse Tunnel Specifications



We have included the cost of a naturally-ventilated 300m² (30m x 10m) galvanized agricultural tunnel.

This natural ventilated tunnel has butterfly flaps and roll up sides, which offers a superior hydroponics environment. (Alternative cheaper and/or Stainless options available upon request)

- The 10 arches -10m bay sizes
- **Superior Height** - Height of apex between 4.1m – 4.5m
- **Naturally ventilated** – Butterfly Sides, manual roll up curtains
- 250-micron agri plastic and/or 40% Grey Shade Netting
- Tunnel floor is covered with 9mm gravel and bidim.



Aquaculture system

The hydroponic tunnel system is powered by a single 5m x 10m aquaculture section. The aquaculture system, inside the greenhouse, comes standard with:



- 3 x 8'600lt Fish tanks - Tanks are manufactured by Ichthys with a galvanised steel mesh support and 550g virgin PVC reinforced mesh Liner, 3.0m diameter and 1.2m high. (Upgrades to conical tanks are available - ***The conical base of the tank provides superior bottom filtration compared to flat based tanks.***)
- Solid lift/solid drain for waste removal from the tanks,
- Single venturi-top-shower inlet system per tank to de-risk the system from aeration failure.
- A tank cover dome – 80% Shade net which is easily opened and closed
- Side tank drain connected to sump
- DC Water pump Solution – that at maximum can pump approximate 30'000lt/hr.
- Eco Aeration solution: Low power air pumps delivering 300lt/min of air through best-in-class diffuser membranes and matala air diffuser tube
- Air and water Manifolds - de-risking single pump dependency

Optional Extra's/ Included in the trout upgrade option:

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- Thermal Tank Side Insulation (25DV by 25mm)

Water runs from the tanks to the swirl filter, through the grow beds and into a sump from which it is then returned to the fish tanks.

Solid Removal and Biofilter



Mechanical filtration on each aquaculture tunnel is achieved using two Matala Media Vortex filters. These state-of-the-art advanced mechanical filtrations provide 10-15 more compact mechanical filtration compared to your standard vortex filters, which equates to more grow space for you. Their ability to remove even the finest of micro particles ensures your beds will never block up with fish waste.

Each Solid filter has a bypass to enable the aquaculture section to be decoupled from the hydroponics system for short periods. Each Filter has a waste tap off function linked to the mineralisation system

Hydroponic System

The “**Professional**” hydroponics systems have 6 different variances. Option 1 is considered as the Base system on which all other prices is discussed.

BASE SYSTEM: Option 1 (Raised/Brick): Professional DWC: 230m² Grow area composed of two 25m x 4.6m “Deep Water Culture” (DWC) per hydroponic system. “Raised-beds DWC” and “Bricked-DWC” options available – pricing the same.

Option 2 (Raised/Brick): Professional Three Tier DWC: 180m² Grow area composed of three 25m x 2.4m “Deep Water Culture” (DWC) per hydroponic system. “Raised-beds DWC” and “Bricked-DWC” options available – pricing the same.

Option 3.1: Professional Media-DWC (no sump): 182m² Grow area composed of two 17.1m x 2.4m and one 24.5m x 2.4m “Deep Water Culture” (DWC), and 24 x 1.7m² Gravel media grow beds per hydroponic system.

Option 3.2: Professional Media-DWC (no Sump): 198m² Grow area composed of two 24.5m x 2.4m “Deep Water Culture” (DWC), and 40 x 1.7m² Gravel media grow beds per hydroponic system.

Option 3.3: Professional Media-DWC with Sump: 184m² Grow area composed of three 18.5m x 2.4m

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“Deep Water Culture” (DWC), and 30 x 1.7m² Gravel media grow beds per hydroponic system.

Option 4: Professional Media with 13’500lt Sump: 209m² Grow area composed of 120 of 1.7m² Gravel media grow beds per hydroponic system.



The gravel grow beds breaks down the ammonia to nitrite and nitrate, acting a natural bio and mechanical filter, and is recommended due to its stabilization factor in overall system. Recommendation will be to use 19mm gravel as the grow media. Should you wish to also grow leafy veg such as lettuce then the grow beds can easily be converted into float beds at no extra cost.

Specially imported high density Isoboard (300kPa / 40DVA) as float rafts ensures a significantly increased the lifespan of your rafts (15DVA polystyrene rafts is generally replaced every 3-5 months).

Raised vs. Bricked DWC: The “Raised DWC” is a pre-built PVC structure made of 50mm class 6 piping. It enables rapid and simple installation, and provides benefit of mobility for the future. In comparison, the “Brick DWC” structure is built out of brick and mortar, which provides superior strength and longevity, but requires more labour and is fixed.

Power requirements & Back Up Systems

The system has been designed specifically for a low power requirement. It utilizes low-head Jebao DC pumps and low power Jebao air pumps. Note that the system is solar enabled, but a solar powered solution will be in addition to the quote which assumes a power supply. You will require backup power at the site. Total consumption of each individual tunnel is unlikely to exceed 1.0kW/hour draw, with an average of 0.65kW/hour. The average excludes the heat pump power requirement, which we recommended to run off the main power supply.

Aeration



Air supply to the system is primarily through Matala air diffuser disc membranes in the fish tanks, and the Matala aerotube air lines in the DWC hydroponic systems. Fail-safes are designed through use of “manifold systems” which connects multiple air pumps in parallel, effectively reducing risk of air pump

dependencies.

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3. Estimated Labour for Build

Below provides you with an estimate on labour required to construct the system. Installation effort is estimated and can be done through Ichthys or independently.

System: DWC System's Option 1 and Option 2

Item Supplied in cost by Ichthys	Units
DWC Systems – Option 1 & 2 Overall Project Staffing per System	
Lead Builder Labour (days)	13
Assistant Builder Labour (days)	13
Electrician Labour (days)	5
Project Management (days)	10
4 Extra local labourers/ each	12each
	Total: 48 days
Greenhouse Structure Erection	R25'000

System: DWC-Media Hybrid System's Option 3

Item Supplied in cost by Ichthys	Units
DWC-Media Hybrid – Option 3 Overall Project Staffing per System	
Lead Builder Labour (days)	26 days
Assistant Builder Labour (days)	26 days
Electrician Labour (days)	5
Project Management (days)	15
	25/each
4 Extra local labourers/ each	Total 100days
Greenhouse Structure Erection	R25'000

System: Media Only System's Option 4

Item Supplied in cost by Ichthys	Units
Media Only – Option 4 Overall Project Staffing per System	
Lead Builder Labour (days)	45 Days

Assistant Builder Labour (days)

45 Days

Electrician Labour (days)

5 days

Project Management (days)

22 days

50days/each

4 Extra local labourers/ each

200 – 220 Days Total

Greenhouse Structure Erection

R25'000

It is recommended to use an Ichthys Lead Builder for 2-3 weeks to support on technical detail in the construction process

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4 System Bill of Quantities – Materials supplied for BOQ

The table below provides detail of all the materials/equipment/sub-components supplied for the major components listed below. Construction option will determine if outsourced, hybrid, or self constructed.

The greenhouse and Aquaculture comes standard for all professional systems.

Major Components to be constructed as part of the Design	Units
Overall System	
Galvanised Greenhouse (30m x 10m x 4.1-4.5m(h))	1
Electricity Plug Point	1
Electricity DB Board	1
Mineralisation Box System	3
Dosage Supplementation Buckets	4
Aquaculture System - Trout	
Flat Bottom Tanks (8'600liter) – 3 Per Tunnel (<i>Incl.; Venturi-Top Shower Inlet System; Tank Dome Cover; Solid Lift 90mm</i>)	3
Jebao DCP 20'000 Water Pumps (<i>Incl. Pump Manifold</i>)	3
Jebao PA100 Eco Air Pumps (<i>Incl. Pump Manifold</i>)	3
Matala Airline & Diffuser Disc system with manifold	3
Piping and joins	1
Matala Vortex Swirl filters (<i>Incl. Waste Tap off System</i>)	3

OPTIONS: Select the hydroponics system of your choice. Below is the Bill of Quantities for each system:

BASE: Hydroponic Grow System Option 1: Professional DWC -230m²	
DWC Grow Beds (25x 4.6m) – Brick or Raised Options	2
Float Raft 300kPA – 40mm Extruded Board	319
Grow Cups – 50mm	5'750
Jebao PA100 Air Pumps	2
Matala DWC Airline System 25m	6
Hydroponic Grow System Option 2: Professional Three Tier DWC -180m²	
DWC Grow Beds (25x 4.6m) – Brick or Raised Options	2

Float Raft 300kPA – 40mm Extruded Board	250
Grow Cups – 50mm	4'500
Jebao PA100 Air Pumps	2
Matala DWC Airline System 25m	3

Hydroponic Grow System Option 3: Professional Media-DWC with Sump – 184m²

Media/Gravel Medium Grow beds (Brick frame) (1.2 m x 1.4m)	30
Bell Siphons	30
DWC Grow Beds (18.5 x 2.4m)	3
Float Raft 300kPA – 40mm Extruded Board	185
Grow Cups – 50mm	3'330
Jebao PA100 Air Pumps	2
Matala DWC Airline System 18.5m	3
Sump 6'750lt (3m(l) x 1.5m(w) x 1.5m(d))	Optional

Hydroponic Grow System Option 4: Professional Media-DWC No Sump -182m²

Media/Gravel Medium Grow beds (Brick frame) (1.2 m x 1.4m)	24
Bell Siphons	24
Matala Vortex Swirl filters (Incl. Waste Tap off System)	1 Less
DWC Grow Beds (17.1x 2.4m)	2
DWC Grow Beds (24.5x 2.4m)	1
Float Raft 300kPA – 40mm Extruded Board	195
Grow Cups – 50mm	3'520
Jebao PA100 Air Pumps	2
Matala DWC Airline System	3

4. Solar Solutions

Part or full Solar solution (please enquire separately for proposed solutions)