PRODUCTION INNOVATIONS IN *L. vannamei* APPLYING “HETEROTROPHIC INTENSIVE CARE NURSERY” (HICN) TO GROWOUT PONDS

John WEIR, CEO and Founder

DAPETSA Consulting Group - DGC
The state of ag is difficult...
But there is promise, in using innovation and technology

Dave Puglia, Forbes AGTECH, Salinas Ca, 2019
ECUADOR
SUCCESSFUL ON FARM STORY
ECUADOR´S FACTS - LEADERSHIP

- Shrimp Industry Pioneer in the Occidental Hemisphere.
- During lately years, disease presence such as IHHNV, WSSV, EMS) have reduced production causing important economic losses.
- Genetic improvement, biotechnology development, RAS and Nursery Systems had increased profits and yields in cultures.
CAGR FROM LAST 5 YEARS – ECUADOR CAN REACH 650,000 TON DURING 2020
In lately years, worldwide shrimp production has been severely affected by many disease outbreaks reducing performance and crop yields. This has encouraged to apply new production and management techniques.
Is well known, shrimp’s immune system develops strength during early production days in culture, for such reason it is important to maximize efforts in this stage in order to reduce disease affections.
We have been developing a production innovation technique for juvenile shrimp called “Heterotrophic Intensive Care Nursery” (HICN), designed to improve health status and animal quality, minimizing infections increasing survival rate, FCR and sizes.
2013 – 6 years ago

First prototype – stocking density 5 PL per Lt
MAXIMIZING JUVENILE PRODUCTION

RESERVOIR

FU - SS removal

DISINFECTION

NURSERY RESERVOIR

SPECIALIZED FEED
PATHOGEN CONTROL
PARAMETER CONTROL
(software/hardware):
- DO
- TAN
- pH

HI CN phase 1 - 2

BIOTECHNOLOGY
Microbiota
Microbiome
C:N

GROWOUT
HICN OUTPUT — 2 PHASE PRODUCTION

FILTRATION UNIT
Free of Heavy Metals and Toxins

HEALTH PROGRAM
Custom made Probiotics and Pathogen control

MANAGEMENT PROGRAM
Production Control and Parameter Evaluation

SPECIALIZED FEED
High quality Protein and Digestibility

SMART SOFTWARE
Real Time SENSOR for critical parameter control and predictable data

OUR PARTNER!
AquA TELCO
RESERVOIR
Filtration, aeration and disinfection to keep water quality ready to use during the whole HICN process.
PHASE 1 – Intensive Care Nursery

- Stocking size PL 300 per gram
- Production time at this Phase 12 -15 days
- Stocking density between 20 to 30 PL per Lt
- Transfer size to next Phase 10 to 20 pcs per gram
PHASE 1 – Intensive Care Nursery HD
PHASE 2 – Intensive Care Nursery LD

- Stocking size juvenile 10 to 20 per gram
- Production time at this Phase 15 -35 days
- Stocking density between 2 to 10 pcs per Lt
- Harvest weight depends on farm needs; from 0.5 to 2.0 gram and up!
- Total biomass at harvest is no more than 6 Kg/m3 water
In Phase 2, tanks have same characteristics than Phase 1, but 3 to 5 times larger in volume.
HEALTH PROGRAM - TREATMENTS

- Water filtration with our SS media state of the art material to remove heavy metals, pesticides and toxins plus a 10 micron screen
- Water disinfection with our 1-2-3 acid/basic antibacterial process
- Organic carbon ready to use, directions for reaching ideal ratios
- Microbiota balance using our 3 probiotic concentrated formulations, water column and feed
- Vibriosis control, non-antibiotic, growth promoter, anti-stress additives
TRANSFERING TO GROWOUT PUMP

Pump System, successfully used in the salmon industry at Chile

Has been used in Ecuador and Mexico applied to PL juvenile transferring

Can easily move 15 Kg/min biomass up to 3 Km
TRANSFER TO GROWOUT TOWER

Proved to be successful for large operations

Gravity flow

Can easily move biomass to selected distances connected to transporting pipes
TRANSFERING TO GROWOUT TRUCK

This is the most common and basic method used among our customers. Juveniles are loaded in a 500 Lt container assisted by oxygen during transportation to ponds inside the farm.
GROWING BIOMASS

From Hatchery

PL – 300/g
0.003 g

PL – 20/g
0.05 g

PL- Juv. – 1-2/g

To HICN – to Growout

15 to 35 days

J - 2 to 3g

Growing biomass 15 to 35 days
Temperature: 29 – 32 Celcius

DO: >5 ppm

pH: 7.2 – 7.8

NH4+: <1 mg/L

Alkalinity: >130 mg/L

Bacteriology: TCBS water and shrimp sample, 1 time every 2 days

Pathology: Every day

Weight sampling: Every day
WHAT ARE THE HICN CONCERNS?

- **BIOSECURITY:** Water quality unbalance, specially TAN, pH, temperature and DO
- **DISEASES:** Bacterial (Vibrio sp., Pseudomonas sp.) and Parasites
- **INPUTS:** PL quality from hatchery. Pathology and Bacteriology analysis is a must...
DISEASE - HEALTH CONTROL

**PROBiotics**

- Anaerobic Facultatives, Saprophytes Bacillus spp. Strains
- Heterotrophic Application Custom Made Formulas for, Activation and Direct Use
- From 1,000 billion CFU/Kg to 100,000 billion

**Anti-Microbials**

- Proprietary Formulation*
  Organic/Inorganic Acidifier Additive - Patent# WO2009US55989 USA
- Pathogenic Bacteria Control (Vibrio, Pseudomona, Rickettsia). Highly Effective, for Disease Control
- Easy to use
- Non Residual – Non Hazardous
- Environmental Friendly

*Proprietary water and feed effective treatments
BUILD UP KNOW HOW
- Learning about our customer needs at the farm, we detail a proposal to implement the HICN system.
- Providing technical support to build the HICN infrastructure (drawings, power requirements, air and filtration equipment, production materials, additives and tools, digital platform and app.

OPERATION
- Farm support with local and overseas experts visits.
- Training:
  ▪ Local training of the farm staff from our Technical Directors and from HICN expertise, in site.
  ▪ Follow up 24/7 at the farm, assisted by our technical staff and AQUA-TELCO digital platform.
  ▪ Data analysis for improvement adjustments, upon local experiences and challenges.

OUR SERVICE TO IMPROVE SHRIMP FARMING OPERATIONS WITH “HICN” SYSTEM IS TO PROVIDE ALL WORKING TOOLS TO THE FARM AND TO TEACH AND GUIDE HOW TO MANAGE SUCCESSFULLY
SMART
AQUACULTURE
ACUACULTURE AS A SERVICE

1. IoT Sensors
   Hardware that collects live data.

2. Wireless connectivity
   Wireless network that transmits all the data.

3. Cloud Platform
   Data processing, Analytics and Storage.

4. Dashboard
   Access to the tools for the decision making process.
   Metrics and KPI's defined.

5. Machine Learning
   Predictive Algorithm application based in past data.

6. Artificial Intelligence
   (coming soon)
   Learns from the information and makes decisions by itself.
AQUATELCO´S HEART OF STONE PLATFORM

- Multi-level
- Multi-user
- Multi-Vertical
- Multi-biomass
- Multi-language
- Real time Dashboards
- Intuitive Graphics
- Statistical and historical data
- Real time data
- Charts with both types of data mixed
- One centralized System
- Alerts and notifications via App and Mail
- Executive reports
- Third party integrations
- Predictive information
TAYLOR MADE SIZE...

DESIGNED UP TO 6 Kg/m3 BIOMASS
NO LIMITS!

2,000 TON – BIGGER UNIT BUILT SO FAR.....
CUSTOMER FEEDBACK
RESULTS FROM HETEROTROPHIC INTENSIVE CARE NURSERY (HICN) TO GROWOUT PONDS
SUPESCA/MARDELSA FARMS (gulf of Guayaquil)
From JAN to MAY, 2019

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<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
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<td>0.32</td>
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<tr>
<td>Final weight (g)</td>
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<td>20</td>
<td>17</td>
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<td>FCR</td>
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<td>LB/Ha</td>
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<td>5354</td>
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<td>Survival%</td>
<td>48</td>
<td>58</td>
<td>55</td>
<td>56</td>
<td>62</td>
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SUPESCA & MARDELSA Farms, Gulf of Guayaquil

Production 2019 – Jan to May

FCR 2019 Jan to May

30% FCR reduction
RESULTS FROM (HICN) TO GROWOUT PONDS
SOLCAPITAL FARMS (El Oro, south Ecuador)
Reported on May, 2019

<table>
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<th>1S - 2018</th>
<th>2S - 2018</th>
<th>1Q - 2019</th>
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<tbody>
<tr>
<td>Initial weight (g)</td>
<td>0.59</td>
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<tr>
<td>Final weight (g)</td>
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<td>Stock density (pcs/m²)</td>
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<tr>
<td>AWG</td>
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<tr>
<td>FCR</td>
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<tr>
<td>Production LB/Ha</td>
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<tr>
<td>Survival%</td>
<td>62</td>
<td>66</td>
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<tr>
<td>DOC</td>
<td>104.5</td>
<td>99.53</td>
<td>91.82</td>
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</tbody>
</table>

1.4  1.45  1.5  1.55  1.6  1.65  FCR AVERAGE

104.5  99.53  91.82  DATA FROM 2Q WILL BE PROVIDED BY THE END OF JULY 2019
WHAT DO WE GAIN WITH IT?

Our HICN Shrimp Farming System, produces many sustainable benefits?

- Less time in production
- Higher profit
- Bigger sizes
- More survival
- Zero antibiotic clean animals

Proven Technology with trusted results in different countries
THANK YOU VERY MUCH
FOR YOUR KIND ATTENTION