

### IMPROVE PRODUCTION EFFICIENCY AND MANAGEMENT IN AQUACULTURE OPERATIONS USING ICT AND DATA MINING TECHNOLOGIES

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aquaManager



#### FENACAM 2017

November 15 – 18, 2017

Natal, Brazil

### Outline

- Management Challenges that producers face
- ICT and Data mining
  - ▶ Benefits
  - ▶ Examples
  - № Business cases
- Additional benefits
- ▶ Conclusion



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### Introduction Who we are

- ≥ i2S aquaManager Team
- More than 20 years of experience in ICT for aquaculture
- № Global presence multiple species
- >>> Research projects with prominent academic institutions
- Multiple publications presentations in conferences all over the world



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Increasing demand for fish protein

Aquaculture surpassed

Fastest growing animal

food producing sector

capture fisheries

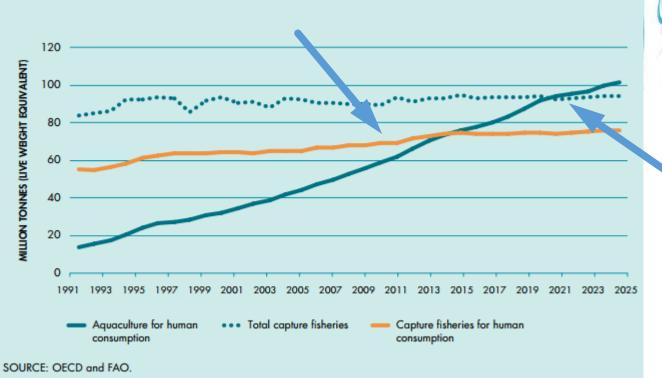
in the world

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Huge social and economical potential

**GLOBAL CAPTURE FISHERIES AND AQUACULTURE PRODUCTION TO 2025** 



Introduction





## The Challenge

### **Key elements of aquaculture production**

- > **Extremely sensitive** to feed, conversion, health, bio-security
- Feed and health represent70% of OPEX
- > Making right decisions

- Scheduling
- Respond to challenges in real time
- Know what is happening, why it's happening, as it happens



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### The Challenge Approach

What a successful company must do - 1

- Check everyday feeding (management of fish in general) integrity
- Evaluate performance among units compare this performance to the expected one
- Improve profitability through better planning
- Compare growth, mortality, cost to the one of the production plan
- Identify problems immediately



### The Challenge Approach

What a successful company must do - 2

- >>> Support management for decision making
- Evaluate feed suppliers and feeding policies
- Ensure production information is collected corrected
- Make best use of **available resources**
- >>> Exploit available data to improve production
- ▶ And many more...



### The Challenge

### Sounds like a lot of work!





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## The Challenge

### Can someone do this without a system?

- >>> Very difficult to control cost drivers
- >>> No timely identification of production issues or trends
- > **Difficult to evaluate** feed and fry suppliers
- >>> Purchasing policies based on aggregated means
- Production planning based on rough estimations
- > Higher management cost
- 🔊 Mistakes
- >>> **No support** for decision-making

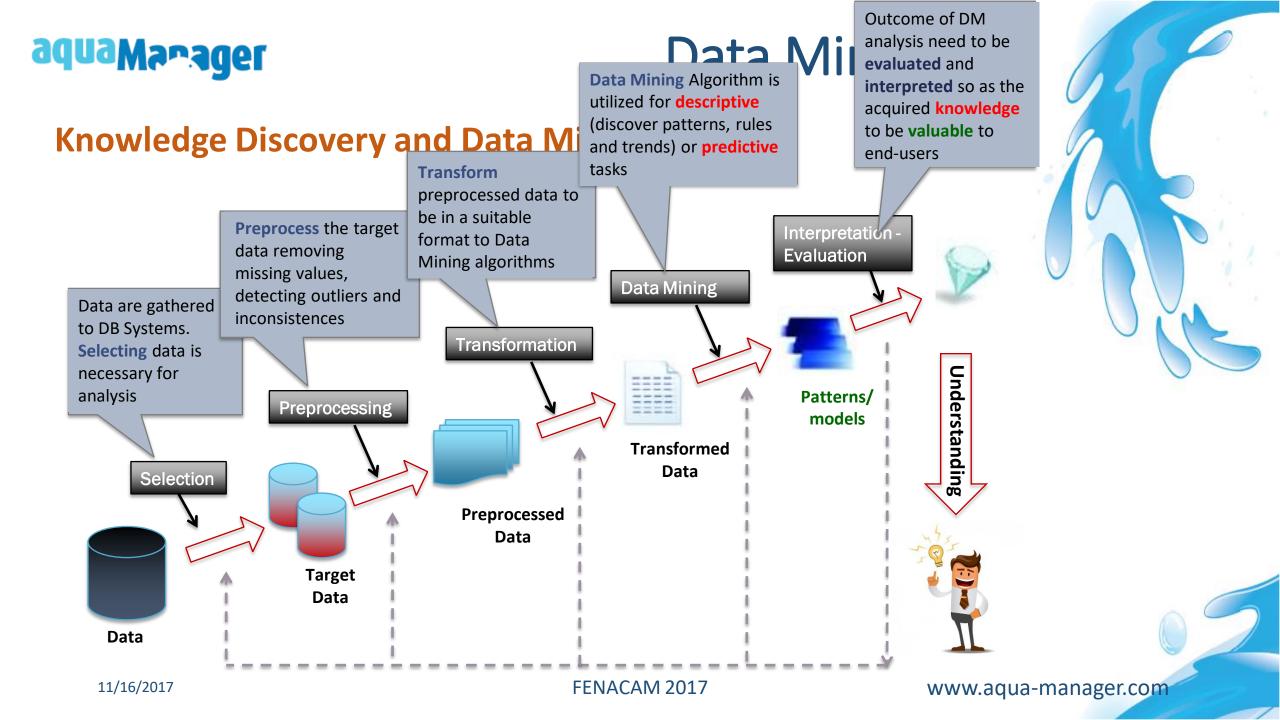




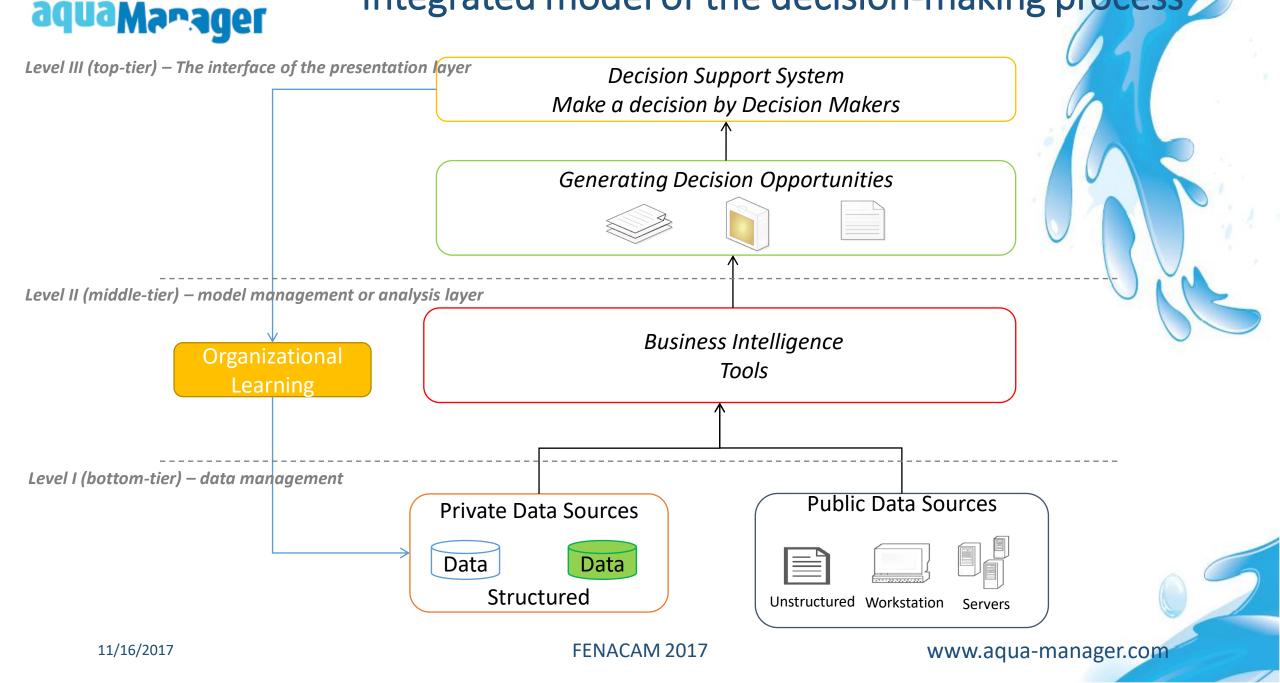
### **ICT Benefits**

- **Benefits of using Information Technology**
- **Lower production costs**
- Improved profitability
- Improved operational efficiency
- Management support for decision-making
- >>> Efficient and effective **management** of equipment and human resources
- >> Production at the **right time**, with the **right size**
- Improved product quality
- >>> Supplier evaluation
- >>> Optimization of stock levels and purchase policies





### Integrated model of the decision-making process



### aquaMarager In-depth analysis of data = Performance Improvement

### A good IT system provides tools that:

- Allows the company to understand which units and batches are in or out-of-control and take corrective actions. Without a system this info comes too little, too late.
- Continuously evaluate performance
- Visualize and analyze data. Prevent problems before they escalate.
- Optimize the feeding strategy, based on the specific conditions of the farm

# Data mining Benefits / 1

**Big savings come from data mining** 

- >>> Transform data into knowledge.
- Accurate view of the life to date fish behavior.
- >>> Better track of the **living inventory** (biomass)

based on the analysis of all environmental and biological data.

Substantial improvement of the growth model, which has great impact on predictions, business plans efficiency etc.



Jadeuewenbe



Make accurate estimations of the growth of the fish and the result of the production every day.

Minimize uncertainty and moreover contribute to more precise production and financial plans.

Improve the quality and validity of the collected data through fraud detection and identification of false data (outliers)

Jadeuewenbe

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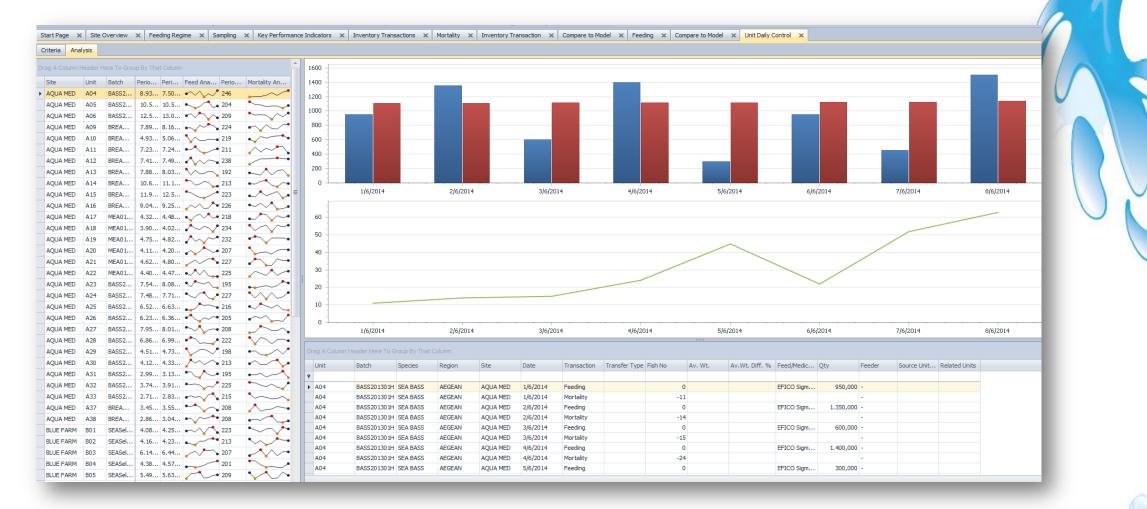


# Let's get more practical....



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### Example 1 – Feeding Control



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## Example 2 – Problem Identification

Ala	larm	Site	Unit	<ul> <li>Species</li> </ul>	Batch	Origin	Fish No	Av. Wt.	Biomass	Econ. FCR	Biol. FCR	Av. Wt. Ca	M %	A%	BFCR	EFCR	Grading	Unit Group	Last G
	0																		
	0	AQUA MED	A04	SEA BASS	BASS201301H	2013	269.907	362,49	97.838,59	2,12	2,01	X 300 - 500	۲	۲	۲	۲		AM1	
	<b>@</b>	AQUA MED	A05	SEA BASS	BASS201301H	2013	320.916	361,49	116.007,92	2,10	2,00	X 300 - 500		۲	۲			AM1	
	<b>@</b>	AQUA MED	A06	SEA BASS	BASS201301H	2013	377.143	351,49	132.561,99	2,09	2,03	X 300 - 500		۲	۲			AM1	
	<b>@</b>	AQUA MED	A09	SEA BREAM	BREAM201	2013	237.133	362,65	85.996,28	2,05	1,94	X 300 - 500	۲	۲	۲	۲		AM1	
	<b>@</b>	AQUA MED	A 10	SEA BREAM	BREAM201	2013	148.857	356,88	53.124,09	2,14	1,93	X 300 - 500	۲	۲	۲	۲		AM1	
	0	AQUA MED	A11	SEA BREAM	BREAM201	2013	220.090	358,17	78.829,64	2,05	1,92	X 300 - 500	۲	۲	۲	۲		AM1	
	<b>e</b>	AQUA MED	A12	SEA BREAM	BREAM201	2013	219.396	347,00	76.130,41	1,97	1,92	X 300 - 500		۲	۲	۲		AM1	
	<b>@</b>	AQUA MED	A13	SEA BREAM	BREAM201	2013	234.401	345,54	80.994,92	1,97	1,93	X 300 - 500		۲	۲			AM1	
	<b>9</b>	AQUA MED	A14	SEA BREAM	BREAM201	2013	313.916	347,12	108.966,52	1,97	1,93	X 300 - 500	۲					AM1	
	<b>9</b>	AQUA MED	A15	SEA BREAM	BREAM201	2013		354,22		-	· · · · ·	X 300 - 500						AM1	
	<b>9</b>	AQUA MED	A 16	SEA BREAM	BREAM201	2013		359,56				X 300 - 500	۲	۲	۲	۲		AM1	
	<b>9</b>	AQUA MED	A17	MEAGRE	MEA01301S	2013		680,00				Z 500 - 1000	۲	۲	۲			AM1	
_	<b>9</b>	AQUA MED	A 18	MEAGRE	MEA01301S	2013						Z 500 - 1000	۲	۲	۲			AM1	
	<b>9</b>	AQUA MED	A19	MEAGRE	MEA01301S	2013		680,00				Z 500 - 1000	۲	۲	۲			AM1	
	<b>9</b>	AQUA MED	A20	MEAGRE	MEA01301S	2013		680,00		-		Z 500 - 1000	۲	۲	۲			AM1	
	<b>9</b>	AQUA MED	A21	MEAGRE	MEA01301S	2013		680,00				Z 500 - 1000	۲	۲	۲			AM1	
	<b>9</b>	AQUA MED	A22	MEAGRE	MEA01301S	2013		555,75				Z 500 - 1000	۲	۲	۲			AM1	
	<b>9</b>	AQUA MED	A23	SEA BASS	BASS201301N			326,33	· · · · ·			X 300 - 500						AM1	
	<b>9</b>	AQUA MED	A24	SEA BASS	BASS201301N			324,03				X 300 - 500							
	<b>9</b>	AQUA MED	A25	SEA BASS	BASS201301N			323,99			· ·	X 300 - 500						AM1	
	<b>9</b>	AQUA MED	A26	SEA BASS	BASS201301N			325,30	· · · ·			X 300 - 500						AM1	
	<b>9</b>	AQUA MED	A27	SEA BASS	BASS201301N			323,93	· · · · ·			X 300 - 500						AM1	
(	<b>e</b>	AQUA MED	A28	SEA BASS	BASS201301N			349,94	· · · · ·			X 300 - 500			0				
	<b>e</b>	AQUA MED	A29	SEA BASS	BASS201301N			351,76				X 300 - 500			0				
	<b>V</b>	AQUA MED	A30	SEA BASS	BASS201301N	2013	123.929	355,31	44.033,21	2,13	2,05	X 300 - 500	۲	۲	۲	۲			
	<b>@</b>	AQUA MED	A31	SEA BASS	BASS201301H	2013	89.134	365,00	32.533,91	2,17	2,06	X 300 - 500							

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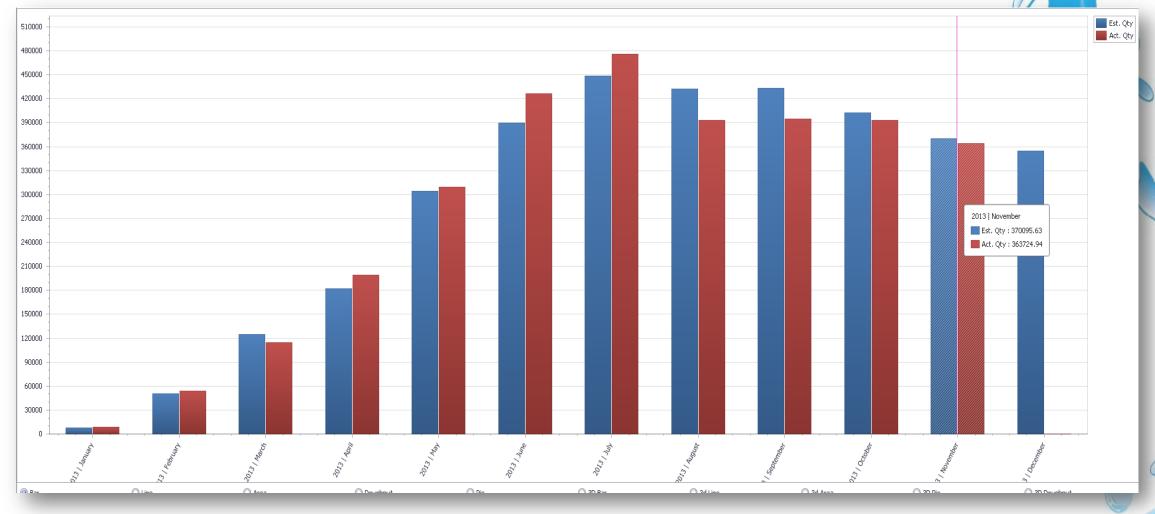
# Example 3 – Performance Benchmarking

Calculate Model																	
SFR Adjustments			FCR Adjust	ments			Start Date										
User Defined	Default		Oser Def	îned (	Default		Fish Stock	king	Unit Start		Project t	o Target					
Details						Average Weig	ht		Mortality %			Food / Kg			FCR		
ast Sampli Last Harve	Unit	Batch	Species	Fish No	Grading	Actual	Model	Deviation %	Actual	Model	Deviation %	Actual	Model	Deviation %	Actual	Model	Deviation %
30/6/2014	A12	BREAM201	SEA BREAM	219.396		347,00	311,21	11,50	6,64	9,3	79 32,18	1,95	2,6	8 27,05	1,97	2,7	70 27,
30/6/2014	A13	BREAM201	SEA BREAM	234.401		345,54	311,21	11,03	6,24	9,3	79 36,27	1,95	2,6	8 27,07	1,97	2,7	70 27,
30/6/2014	A14	BREAM201	SEA BREAM	313.916		347,12	312,57	11,05	4,87	9,3	74 49,96	1,95	2,6	9 27,36	1,97	2,7	71 27,
30/6/2014	A15	BREAM201	SEA BREAM	359, 198		354,22	314,34	12,69	4,21	9,3	73 56,69	1,95	2,6	9 27,69	1,96	2,7	71 27,
30/6/2014	A16	BREAM201	SEA BREAM	273.907		359,56	317,41	13,28	5,55	9,3	74 43,03	1,95	2,6	9 27,49	1,96	2,7	72 27
30/6/2014	A17	MEA01301S	MEAGRE	103.836		680,00	512,99	32,56	13,47	7,	38 -82,52	1,54	2,4	4 36,85	1,55	2,4	46 37
30/6/2014	A18	MEA01301S	MEAGRE	93.743		680,00	512,88	32,58	14,78	7,	39 -99,99	1,55	2,4	4 36,67	1,55	2,4	46 36
30/6/2014	A19	MEA01301S	MEAGRE	113.674		680,00	514,27	32,23	12,56	7,	18 -74,91	1,56	2,4	7 36,81	1,57	2,4	49 36
30/6/2014	A20	MEA01301S	MEAGRE	98.926		680,00	513,58	32,40	13,98	7,3	-93,06	1,55	2,4	6 36,93	1,56	2,4	48 37
30/6/2014	A21	MEA01301S	MEAGRE	109.045		680,00	513,00	32,55	12,76	7,	38 -72,95	1,50	2,4	4 38,64	1,50	2,4	46 38
30/6/2014	A22	MEA01301S	MEAGRE	103.882		555,75	513,16	8,30	13,43	7,	60 -84,00	1,84	2,4	5 25,07	1,85	2,4	47 25
30/6/2014	A23	BASS201301N	SEA BASS	234.458		326,33	298,49	9,33	6,22	9,4	1 33,93	2,16	3,0	0 27,87	2,18	3,0	02 27
30/6/2014	A24	BASS201301N	SEA BASS	234.244		324,03	297,71	8,84	6,30	9,4	16 33,38	2,15	2,9	9 28,01	2,17	3,0	02 28
30/6/2014	A25	BASS201301N	SEA BASS	204.079		323,99	295,93	9,48	7,24	9,4	15 23,42	2,15	2,9	9 28,01	2,17	3,0	01 28,
30/6/2014	A26	BASS201301N	SEA BASS	194.066		325,30	301,11	8,03	7,59	9,4	19,45	2,18	2,9	9 27,22	2,19	3,0	02 27
30/6/2014	A27	BASS201301N	SEA BASS	249.001		323,93	297,71	8,81	6,04	9,4	łó <b>36,1</b> 8	2,16	2,9	9 27,80	2,17	3,0	02 27
30/6/2014	A28	BASS201301N	SEA BASS	204.177		349,94	295,93	18,25	7,19	9,4	15 23,89	2,06	2,9	9 30,98	2,08	3,0	01 31
30/6/2014	A29	BASS201301N	SEA BASS	134.568		351,76	297,71	18,16	10,29	9,4	16 -8,75	2,09	2,9	9 30,09	2,10	3,0	02 30
30/6/2014	A30	BASS201301N	SEA BASS	123.929		355,31	302,36	17,51	11,48	9,4	+1 -21,99	2,12	3,0	0 29,45	2,13	3,0	03 29
30/6/2014	A31	BASS201301H	SEA BASS	89.134		365,00	297,63	22,64	13,10	9,6	-35,79	2,15	3,0	0 28,26	2,17	3,0	02 28
30/6/2014	A32	BASS201301H	SEA BASS	108.943		374,12	297,63	25,70	10,95	9,6	-13,44	2,14	3,0	0 28,56	2,16	3,0	02 28
30/6/2014	A33	BASS201301H	SEA BASS	78.835		374,54	297,63	25,84	14,62	9,6	55 -51,45	2,17	3,0	0 27,50	2,19	3,0	02 27
30/6/2014	A37	BREAM201	SEA BREAM	99.040		378,27	311,21	21,55	11,54	9,3	79 -17,90	2,02	2,6	8 24,52	2 2,04	2,7	70 24
30/6/2014	A38	BREAM201	SEA BREAM	83.869		369,96	311,21	18,88	13,56	9,3	79 -38,50	2,04	2,6	8 23,81	2,06	2,7	70 23
	B01	SEASel201301		184.047		191,82	218,43	-12,18	7,98	9,4	13 15,41	2,34	2,7	1 13,66	2,37	2,7	74 13

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# Example 4 – Optimized feeding strategies



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# **Example 5 – Feed evaluation**



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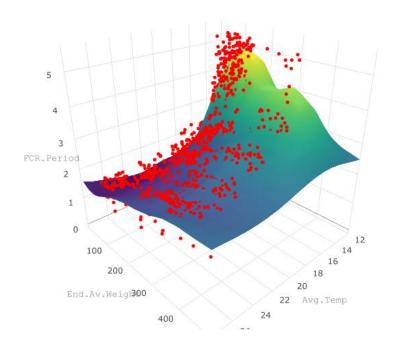
## Business case – Feeding Optimization

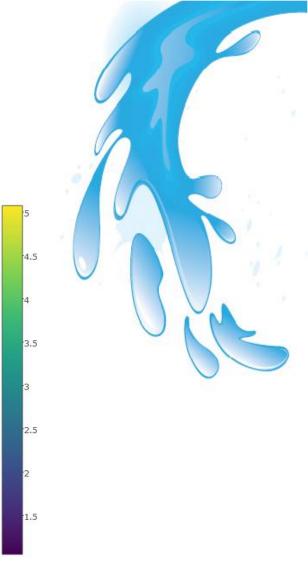
**Company** Open Sea, Cages, 5000 tons / year

#### Achievement

Development of new, optimized Feeding and Growth Models, using advanced data mining technologies

Improvement Reduction of feed cost by 6,8 %

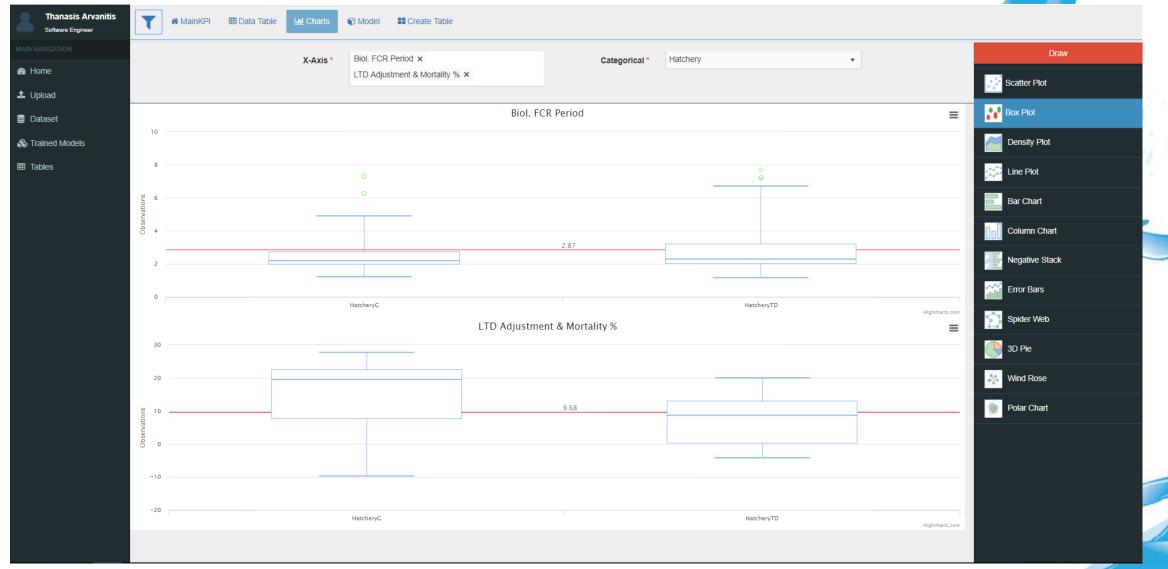




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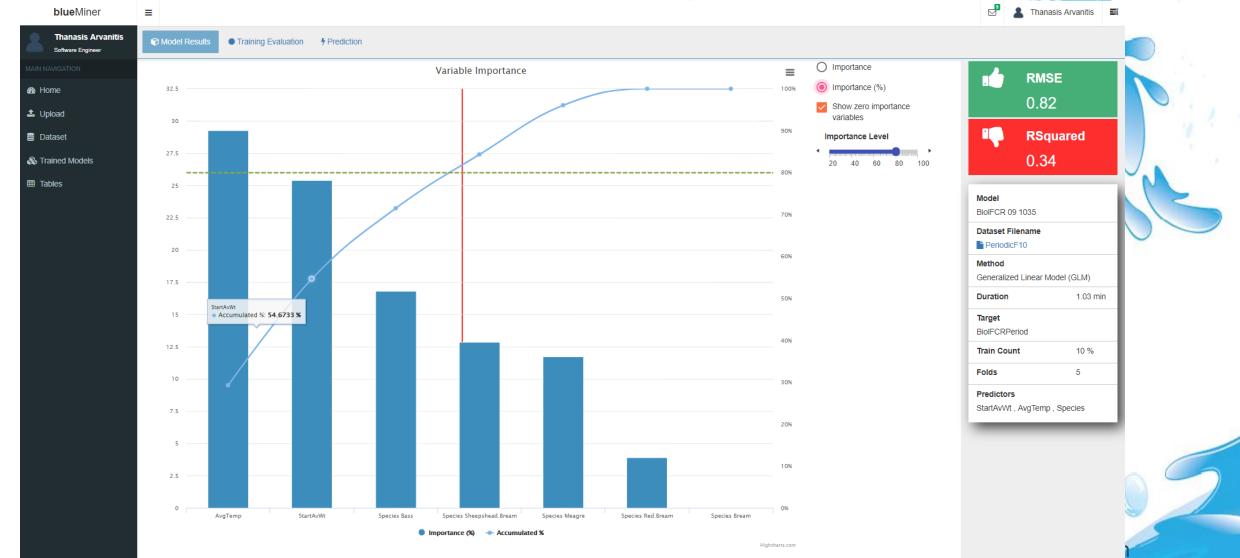
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# aquaMarager Example 8 – Where to focus for improvement



### aquaMarager Business case – Understanding and improving performance

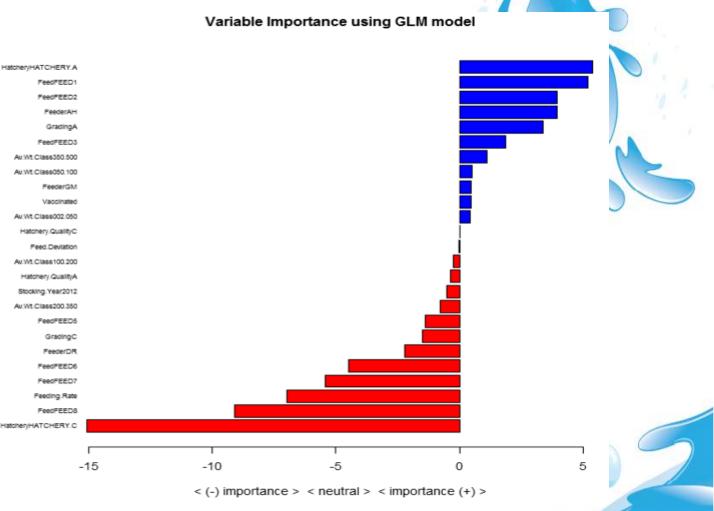
#### **Company** Open Sea, Cages, 12500 tons / year

#### Achievement

Understanding and predicting the impact of various parameters on the fish production process

#### Improvement

Selection of best feed suppliers, fry suppliers and optimization of fish management practices. Reduction of mortalities by 8,4% and cost by 6,2%



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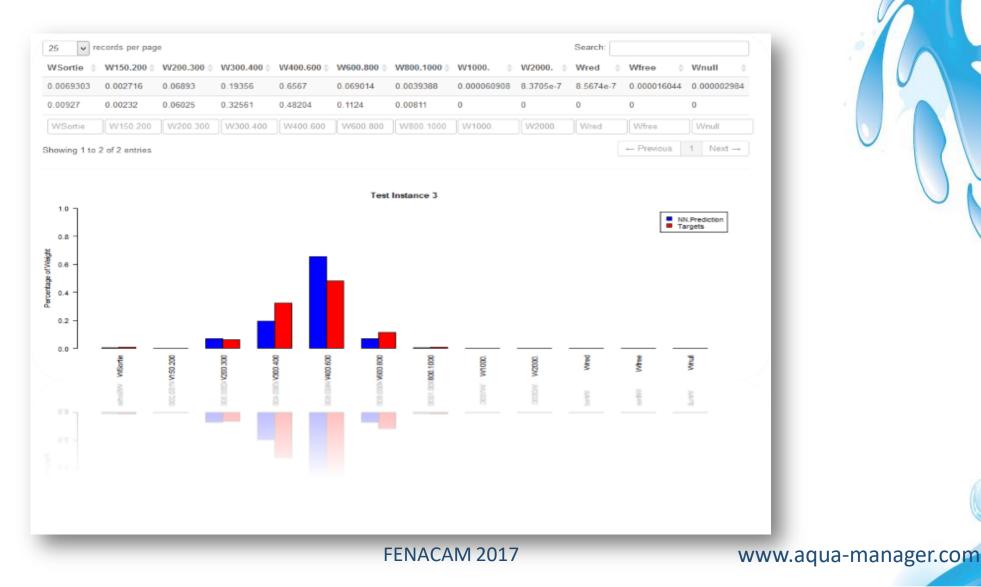
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### Example 9 – Data Validity

blueMiner	=					🛃 🛔 Thanasis Arvanitis	00	
Thanasis Arvanitis Software Engineer	🕂 🏶 MainKPI 🛛 🏛 Data Table 🔛 Charts	Model III Create Table						
MAIN NAVIGATION	:	Econ. FCR Period ×	Categorical *	Species	¥	Draw		)
Home	Numeric Filters					Scatter Plot		
1 Upload	Origin Year	Free F	CD Dawie d					
Dataset	2,010 2,012 2,014 2,016 2,018	Econ. F	CR Period		=	Box Plot		0
& Trained Models	Biol. FCR Period					Density Plot		
I Tables						💭 Line Plot		
	Econ. FCR Period	•				Bar Chart		
	-40 -20 0 20 40					Column Chart		$\langle \rangle$
	Mortality No					Negative Stack		
	SFR Period (%)					Error Bars	<u> </u>	
	0 4 8 12 16 20					Spider Web		
	SGR Period (%)	* 8			Δ	3D Pie		
	-2 0 2 4 6 Growth Per Day					👫 Wind Rose		
	• • • • •					Polar Chart		
	Current Grading							
	Avg. Temp.							
	12         16         20         24         28         32           LTD Mortality %	Bream	Meagre	Red Bream	Sheepshead Bream Highcharts.com			0

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# Example 10 - Prediction of harvest distribution



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## aquaMarager Business case – Fish number and avg. weight estimation

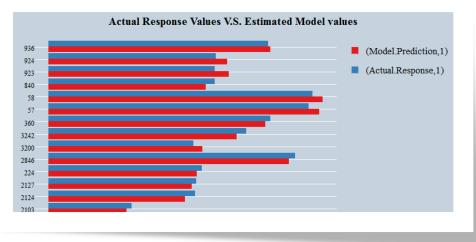
**Company** Open Sea, Cages, 2500 tons / year

#### Achievement

Automatic identification of fish populations with performance problem or populations where fish are missing, using data between samplings and machine learning models

#### Improvement

Optimization of feeding based on the actual biomass. Reduction of feed cost by 7,3% in a period of one year.

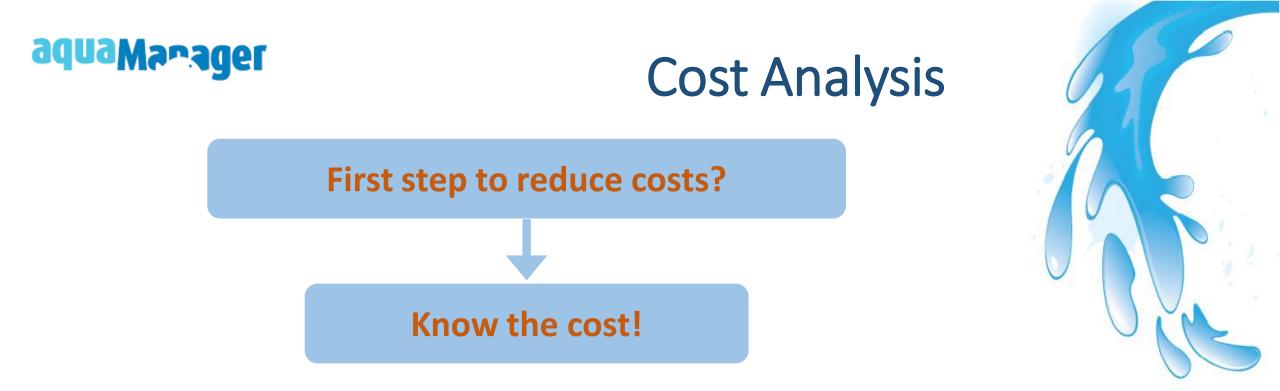




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- >>> Do you know the cost of every unit, batch?
- >>> Do you know the profitability of every harvest?
- ▶ Are you able to make an in-depth audit of the current expenditure?

## Example – Profitability of each harvest

Set N         Set N <t< th=""><th>SEA BASS       SEA BREAM       Grand Total         Set Bass       SEA BREAM       Grand Total         AQUA MED       * Basth       Unit *       Year *       Month *       COGS       Income       Profit       COGS       Income       Profit         AQUA MED       * Bass201301H       * A04       * 2014       Ioù/xoç       11.323,16 €       22.442,00 €       11.118,84 €       11.323,16 €       22.442,00 €       11.118,84 €         AQUA MED       * Bass201301H       * A04       * 2014       Ioù/xoç       19.659,55 €       28.625,00 €       8.966,45 €       48.699,14 €       79.681,85 €       127.928,00 €       48.246,15 €       47.840,00 €       28.160,86 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       23.855,41 €       65.000,00 €</th><th>Region</th><th>Origin Day</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>	SEA BASS       SEA BREAM       Grand Total         Set Bass       SEA BREAM       Grand Total         AQUA MED       * Basth       Unit *       Year *       Month *       COGS       Income       Profit       COGS       Income       Profit         AQUA MED       * Bass201301H       * A04       * 2014       Ioù/xoç       11.323,16 €       22.442,00 €       11.118,84 €       11.323,16 €       22.442,00 €       11.118,84 €         AQUA MED       * Bass201301H       * A04       * 2014       Ioù/xoç       19.659,55 €       28.625,00 €       8.966,45 €       48.699,14 €       79.681,85 €       127.928,00 €       48.246,15 €       47.840,00 €       28.160,86 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       23.855,41 €       65.000,00 €	Region	Origin Day													
Site $\bullet$ Bath $\bullet$ Unit $\bullet$ Year $\bullet$ Month $\bullet$ COGSIncomeProfitCOGSIncomeProfitCOGSIncomeProfit $\bullet$ AQUA MED $\bullet$ A04 $\bullet$ 2014Ioùloq11.323,16 $\in$ 22.442,00 $\in$ 11.118,84 $\in$ IncomeIncomeIntom	Site       Bath       Unit       Year       Month       COGS       Income       Profit	COGS	income Profit				Species 🔺									////
AQUA MED       * A04       * 2014       Ioùxoç       11.323,16 (22.442,00 (11.18,84,84,84,84,84,84,84,84,84,84,84,84,84	→ AQUA MED       + BASS201301H       + A04       + 2014       IoùNoc       11.323,16 €       11.1118,84 €       11.123,16 €       11.132,316 €       22.442,00 €       11.118,84 €         + AQUA MED       + A05       + 2014       IoùNoc       19.659,55 €       28.626,00 €       8.966,45 €       19.659,55 €       28.626,00 €       8.966,45 €         + A06       + 2014       IoùNoc       48.699,14 €       76.860,00 €       28.160,86 €       48.699,14 €       79.681,85 €       127.928,00 €       48.246,15 €         BASS201301H Total       -       79.681,85 €       127.928,00 €       48.246,15 €       79.681,85 €       34.241,40 €       49.400,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       23.144,59 €         + A12       + 2014       IoùNoc       -       -       32.855,41 €       56.000,00 €       23.144,59 €       23.144,59 €       23.928 €       47.840,00 €       23.144,59 €       23.90,54 €       672.000,00 €       34.931,45 €       672.000,00 €       34.931,45 €       672.000,00 €       34.931,45 €       32.064,56 €       672.000,00 €       34.931,45 €       32.065,41 €       672.000,00 €       34.931,45 €       32.064,56 €       672.000,00 €       34.931,45 €       32.064,56 €       <					and the										
$\frac{1}{4} \text{ A05 } = 2014  100\text{ MOC}  19.659,55 \in 28.626,00 \in 8.966,45 \in 10.000 \oplus 19.659,55 \in 28.626,00 \in 8.966,45 \in 10.000 \oplus 10.0000 \oplus 10.000 \oplus 10$	<ul> <li></li></ul>										Income	Profit				
• A06       • 2014       Ιούνος       48.699,14 €       76.860,00 €       28.160,86 €       6       48.699,14 €       76.860,00 €       28.160,86 €         BASS201301H Total       • 409       • 2014       Ιούνος       127.928,00 €       48.246,15 €       79.681,85 €       127.928,00 €       48.246,15 €         • BREAM201301N       • A09       • 2014       Ιούνος       10ύνος       6       34.241,40 €       49.400,00 €       15.158,60 €       34.241,40 €       49.400,00 €       15.158,60 €         • A12       • 2014       Ιούλος       6       6       32.855,41 €       56.000,00 €       23.144,59 €       23.144,59 €         • A13       • 2014       Ιούλος       6       6       330.064,56 €       672.000,00 €       34.935,44 €       56.000,00 €       34.935,44 €	$\frac{1}{48699,14} + \frac{1}{48699,14} + \frac{1}{4869,14} + $	<ul> <li>AQUA MED</li> </ul>	→ BASS201301H				-	-								
BASS201301H Total       × 009       × 2014       Ιούνος       127.928,00 €       48.246,15 €       34.241,40 €       49.400,00 €       15.158,60 €       34.241,40 €       49.400,00 €       15.158,60 €         × BREAM201301N       × A09       × 2014       Ιούνος       Icouvoc       <	BASS201301H Total       79.681,85 €       127.928,00 €       48.246,15 €       79.681,85 €       127.928,00 €       48.246,15 €         +       BREAM201301N       -       A09       + 2014       Ioùvoq       34.241,40 €       49.400,00 €       15.158,60 €       34.241,40 €       49.400,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       49.800,00 €       45.91,45 €       49.807,63,80 €       953.168,00 €       454.404,20 €       49.807,63,80 €       953.168,00 €       454.404,20 €       49.800,00 €       454.404,20 €       49.800,00 €       454.404,20 €       49.805,1 Profit       556.800,01															
▼ BREAM201301N       ▼ A09       ▼ 2014       Ιούνος       Ioύνος       34.241,40 €       49.400,00 €       15.158,60 €       34.241,40 €       49.400,00 €       15.158,60 €         ▼ A12       ▼ 2014       Ιούλος       Ioύλος       Ioúλος       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €         ▼ A13       ▼ 2014       Ιούλος       Ioύλος       Ioúλος       32.855,41 €       56.000,00 €       23.144,59 €         ▼ A14       ▼ 2014       Ιούλος       Ioúλος       Ioúλος       330.064,56 €       672.000,00 €       341.935,44 €       330.064,56 €       672.000,00 €       341.935,44 €	+       BREAM201301N       +       A09       +       2014       IoùNoç       34.241,40 €       49.400,00 €       15.158,60 €       34.241,40 €       49.400,00 €       15.158,60 €         +       A12       +       2014       IoùNoç       21.920,58 €       47.840,00 €       25.919,42 €       21.920,58 €       47.840,00 €       25.919,42 €       23.144,59 €         +       A13       +       2014       IoùNoç       330.064,56 €       672.000,00 €       23.144,59 €       330.064,56 €       672.000,00 €       341.935,44 €       330.064,56 €       672.000,00 €       341.935,44 €       330.064,56 €       672.000,00 €       341.935,44 €       330.064,56 €       672.000,00 €       341.935,44 €       330.064,56 €       672.000,00 €       341.935,44 €       330.064,56 €       672.000,00 €       341.935,44 €       330.064,56 €       672.000,00 €       341.935,44 €       330.064,56 €       672.000,00 €       341.935,84 €       330.064,56 €       672.000,00 €       406.158,05 €       419.081,95 €       825.240,00 €       406.158,05 €       419.081,95 €       825.240,00 €       406.158,05 €       498.763,80 €       953.168,00 €       454.404,20 €       \$54.805   COGS       \$54.805   COGS       \$54.805   Jacome       \$54.805   Jacome       \$54.805   Profit       \$54.805   Profit       \$54.805   Profit		BASS201301H Tota		* 2011	100 100							-			
~ A13       ~ 2014       Ιούλιος       32.855,41 €       56.000,00 €       23.144,59 €       32.855,41 €       56.000,00 €       23.144,59 €         ~ A14       ~ 2014       Ιούλιος       330.064,56 €       672.000,00 €       341.935,44 €       330.064,56 €       672.000,00 €       341.935,44 €	$+ A13 + 2014   Ioù\lambdaioc   Ioùioc   I$				<b>→</b> 2014	Ιούνιος					49.400,00€	15.158,60€	· · ·			
→ A14       → 2014       Ιούλιος         330.064,56 €       672.000,00 €         341.935,44 €       330.064,56 €         672.000,00 €       341.935,44 €	<ul> <li>             A14              v 2014 Ιούλιος         </li> <li>             BREAM201301N Total         </li> </ul> 330.064,56 € 672.000,00 € 341.935,44 € 330.064,56 € 672.000,00 € 341.935,44 €             330.064,56 € 672.000,00 € 341.935,44 €             330.064,56 € 672.000,00 € 341.935,44 €             330.064,56 € 672.000,00 € 341.935,44 €             330.064,56 € 672.000,00 € 341.935,44 €             330.064,56 € 672.000,00 € 341.935,44 €             330.064,56 € 672.000,00 € 341.935,44 €             330.064,56 € 672.000,00 € 341.935,44 €             330.064,56 € 672.000,00 € 341.935,44 € <li>             AQUA MED Total         </li> AQUA MED Total              79.681,85 € 127.928,00 € 48.246,15 €             419.081,95 €             825.240,00 € 406.158,05 €             498.763,80 €             953.168,00 €             454.404,20 €                   76860             48699,14 28160,86             34241,4             21920,58             32855,41             32855,41             554 BA55   COGS             554 BA55   Income             554 BB54   Income             554 BB55   Income			⊤ A12	<b>→</b> 2014	Ιούλιος				21.920,58€	47.840,00€	25.919,42€	21.920,58€	47.840,00€	25.919,42€	
	BREAM20130 IN Total       419.081,95 € 825.240,00 € 406.158,05 € 419.081,95 € 825.240,00 € 406.158,05 €       419.081,95 € 825.240,00 € 406.158,05 € 498.763,80 € 953.168,00 € 454.404,20 €         AQUA MED Total       79.681,85 € 127.928,00 € 48.246,15 € 419.081,95 € 825.240,00 € 406.158,05 € 498.763,80 € 953.168,00 € 454.404,20 €         Immediate the second se			▼ A13	<b>▼</b> 2014	Ιούλιος				32.855,41€	56.000,00€	23.144,59€	32.855,41€	56.000,00€	23.144,59€	
	AQUA MED Total 79.681,85 € 127.928,00 € 48.246,15 € 419.081,95 € 825.240,00 € 406.158,05 € 498.763,80 € 953.168,00 € 454.404,20 €			▼ A14	· 2014	Ιούλιος				330.064,56€	672.000,00€	341.935,44€	330.064,56€	672.000,00€	341.935,44€	
	80000     76860     49400     47840     56000       40000     22442     28626     48699,14     21920,58     32855,41       11118,84     19659,55     8966,45     15158,6     25919,42     23144,59       11323,16     5EA BASS   Profit     5EA BASS   Profit     5EA BASS   Profit			tal												
AQUA MED Total 79.681,85 € 127.928,00 € 48.246,15 € 419.081,95 € 825.240,00 € 406.158,05 € 498.763,80 € 953.168,00 € 454.404,20 €	80000     76860     49400     47840     56000       40000     22442     28626     48699,14     28160,86     34241,4     21920,58     32855,41       11118,84     19659,55     8966,45     15158,6     25919,42     23144,59       11323,16     55A BASS   COGS     55A BASS   Cogs	AQUA MED To	tal				79.681,85€	127.928,00 €	48.246,15€	419.081,95€	825.240,00€	406.158,05€	498.763,80€	953.168,00 €	454.404,20 €	
				40000	1111 11323,16	8,84	19659,55 8966,45		,14 28160,86		34241,4	3,6	21920,58	2	23144,59	SEA BASS   Income SEA BASS   Profit SEA BREAM   COGS

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# **Higher Profitability**

- Cost reduction can increase profitability.
   In many cases big profits come from well-designed, optimized
   production plans
- ▶ A good plan must **maximize the profit margin**
- You need to create a number of alternative, viable budgets and select the most profitable one.



Jadevewenbe

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## Example – Production Planning

🕐 Refresh Ar	nalysis													
ian Details 🛛 Re	esults Costing An	alysis Evaluation	Cash flow Balar	nce Sheet Profit ar	nd Loss Capacity									
verview Foo	d/Month Harvests	Growth Mortalities	s Comparison wit	th Sales Budget										
lan Overview														
Region Site	2													
Species 🔺	Initial Biomass (Kg)	Stockings (Kg) S	Stockings No	Harvests (Kg)	Harvests No	Mortality (Kg) M	ortality No	Final Biomass (Kg) B	iomass Produced Fo	od Consumed (Kg) FC	R			
IEAGRE	164.660			413.952	636.390	5.446	10.793		249.292	1.455.934	5,84			
EA BASS	751.056	1.600	800.000	2.547.430	6.359.513	43.093	234.691	264.956	2.059.730	8.374.557	4,07			
SEA BREAM	398.789			1.638.329	3.634.385	19.135	86.706		1.239.540	3.957.701	3,19			
Grand Total	1.314.506	1.600	800.000	4.599.711	10.630.288	67.674	332.190	264.956	3.548.562	13.788.193	3,89			
	Period Overview	Inventory Lif	fe to Date Overviev	v	Period to Date Overv	view			100110					
Cost / Income Ov	verview					16000000 -								Food Co
Region						-		14.78	5.119					Indirect
Site 🔺	Food Cost	Indirect Cost S	Stocking Cost	Total Expenses	Harvest Income	14000000								Stocking Total Exp
QUA MED	7.811.556,53		160.000,00	8.618.356,53										Harvest
LUE FARM	2.543.612,25		,00	3.190.412,25		12000000 -			_					
IEW FISH	1.511.383,07		,00	1.834.783,07		-								
REMIUM FISH	1.880.629,04	323.400,00	,00	2.204.029,04		10000000								
rand Total	13.747.180,89	1.940.400,00	160.000,00	15.847.580,89	22.726.412,84			8.618.357						
						8000000 -	7.811.557							
						6000000								
						4000000 -			[	2.543.612	3.653.666	1.834.783	[1.880.629] [2.505.695]	
						2000000 -		6.800		646.800		1.511.383 1.761.932	323.400	
						0								
						0 -		AQUA MED		BLUE FARM			PREMIUM FISH	

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Start Page X Sampling X Site Overview X Harvesting X Production Plans X Day View X Data Preparation X Production Plan X

🔚 Calculate 🤤 View Sales Budget Copy Records From Another Plan Archive Plan

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# Business case - Prediction of production KPIs

**Company** Open Sea, Cages, 4200 tons / year

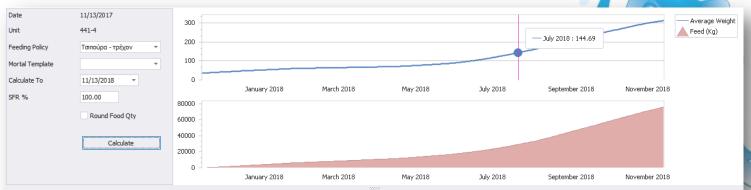
#### Achievement

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More accurate production plans, the company knows exactly what size of fish will be available and when.

#### Improvement

Increased credibility of the company, higher prices



Date	Fish No	Av. Wt.	Feed	Qty	LTD Feed Qty			Feed	Qty	1.86
7/11/2018	146,260	130.55	IRIDA Smart 3,0mm K	274.957	26,301.846		÷	IRIDA Power 2,0mm	6,216.668	LTD Biol. FC
7/12/2018	146,260	131.88	IRIDA Smart 3,0mm K	277.758	26,579.604			IRIDA Smart 3,0mm K	21,934.927	1.86
7/13/2018	146,260	133.22	IRIDA Smart 3,0mm K	280.581	26,860.185			IRIDA Plus 4,5mm	42,871.610	
7/14/2018	146,260	134.58	IRIDA Smart 3,0mm K	283.445	27,143.630			IRIDA Active 4,5mm	4,807.148	
7/15/2018	146,260	135.95	IRIDA Smart 3,0mm K	332.064	27,475.694					
7/16/2018	146,260	137.55	IRIDA Smart 3,0mm K	335.972	27,811.666					
7/17/2018	146,260	139.17	IRIDA Smart 3,0mm K	339.929	28,151.595					
7/18/2018	146,260	140.80	IRIDA Plus 4,5mm	273.892	28,425.487					
7/19/2018	146,260	141.96	IRIDA Plus 4,5mm	321.828	28,747.315					
7/20/2018	146,260	143.32	IRIDA Plus 4,5mm	324.911	29,072.226					
7/21/2018	146,260	144.69	IRIDA Plus 4,5mm	281.459	29,353.685					
7/22/2018	146,260	145.88	IRIDA Plus 4,5mm	283.774	29,637.459					
7/23/2018	146,260	147.08	IRIDA Plus 4,5mm	286.109	29,923.568					
7/24/2018	146,260	148.29	IRIDA Plus 4,5mm	336.178	30,259.746					
				75,830.353		*				

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### **Operational Efficiency**

- >>> Workflow establishment
- Much more **organized** work, **mentality changes**
- >>> Real time notification for the management crew in case of a problem
- Management reports generated **immediately**. Allows production managers to **save time**, **reduce paperwork**, **increase efficiency**

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### Data quality

2 Quick and easy input of production data into a system

▶ Less time required for data entry

> Data Integrity. No more mistakes. Self control.

Find the specific information needed to make better decisions, optimize workflow



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# Management support for decision-making

With all your data in one place, an IT system makes it easy to access and analyze data.

▶ Pivot tables

Charts

**adnaWende** 

Customized to your actual requirements

Reports produced instantly

>>> Effectively analyze performance and take decisions at any level



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# aquaMarager Better Services to customers

>>> Immediate and documented reply to complaints

Quality certificates with information gathered during the life cycle of the fish

IT system supports full traceability of the produced fish and production processes.

A major requirement of the certification bodies

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- Development of a knowledge base with valuable information on fish growth and quality, best practices, growth policies and environmental data.
- Mowledge stays in the company even if a key staff member leaves
- New colleagues can easily learn how the farm operates and get productive quickly

Jadeuever

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### **Knowledge Base**





#### AQUAMANAGER CLIENTS

From automated data collection, to advanced reporting to business intelligence and data mining.

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### Thank you for your attention!!!



We will be happy to hear from you!

If you have any comments, ideas or you would like to learn more, you may email me directly: <u>kbovolis@aqua-manager.com</u>

Or you can visit our website <u>https://www.aqua-manager.com/</u>



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