Experiences in Aquaculture

Kostas Seferis, I2S (GR)
Dudley Dolan, Q-Validus (IRL)
Why Aquaculture?

- The aquaculture industry represents a significant source of protein for people

- Half the fish consumed by humans is produced in fish farms

- Global production is forecasted to increase from 45 million tons in 2014 to 85 million by 2030
As wild fish catches have plateaued, aquaculture has expanded, producing nearly half of fish consumed in 2010. To grow in a sustainable way, aquaculture will need to:

- Produce more fish per unit of land and water
- Reduce its reliance on wild-caught fish for feed.
What is the need for Big Data?

- Aquaculture companies are drowning in data, but starving for knowledge.

- Unfortunately the data are currently unexploited. It is almost impossible to transform these data into knowledge in order to support **smarter decisions, better production** and **efficient management**.

- If we manage to transform data into knowledge, this knowledge can help companies to dramatically improve performance.

- We also need **open Data** in order to share knowledge and improve the skill of personnel.

Organisation sponsors:
What we can get From Big Data

- Data can tell a lot about the parameters influencing the success of the production:
  - environmental parameters
  - feed types
  - feed composition
  - feeding rates
  - Practices like net changes, production management strategies and many others

- They can also be used to identify patterns, trends, problem causes and also to develop predictive and descriptive models.
How we respond to this need?

**aquaSmart** is an EU funded project. It is about enhancing innovation capacity within the aquaculture sector.

- We are developing an innovative cloud platform that helps companies to transform captured data into knowledge, and sharing this knowledge to improve efficiency, increase profitability and help them grow in a sustainable way.
What is new with it?

- It is completely novel and unique. Globally, it is the only data mining and big data technologies initiative applied to the aquaculture sector.
- Our team consists of experts from academia and experienced personnel from Aquaculture companies.
- We are committed to improving the fish production through the science of Statistics, Data Mining and Machine Learning. And all that in the context of adding extra business value into sectors corporate data.
aquaSmart Mentality

- Use state-of-the art technologies to perform data mining at the local level and get actionable results. Companies will be able to know how environmental parameters, feed types, feed composition, feeding rates and practices, net changes, production management strategies influence the main KPIs of the production like FCR, mortality rate, growth rate, production time, health, etc.

- We will offer these tools as a cloud service in order to be easily accessible by all companies, including the SMEs

- However, the project goes much further: through the availability of multi-lingual Open Data, companies will be able to compare their result of their analysis with the ones that are stored into the cloud. This will generate a knowledge base that will be of maximum usefulness for all the stakeholders of the aquaculture sector
aquaSmart Approach

• **Cloud platform**
  - Most aquaculture companies are SME companies. They can’t afford to hire the skilled personnel needed to start their own Data analytics programs.
  - We wanted companies to have seamless data exchange and reuse of stored data, models, forecasts etc.
  - Move from data Islands to a global data Lake.

• **Multilingual Open Data**
  - We target at global knowledge access
  - Exchange of best practices between countries, regions, species.
  - Anonymization Algorithms to protect “sensitive data”

• **Answer Business Questions**
  - Cutting edge technologies
  - Data mining
  - Machine Learning
  - Visualization, Ontology, Advanced analytics, statistics.

Organisation sponsors:
aquaSmart Challenges

• Fish is a commodity thus production numbers are sensitive corporate data.

• “Narrow” the gap between Academics and Industry people.

• Make Data Public without “giving out” crucial corporate information.

• There are not best practices on implementing big data analytics in aquaculture sector, we are the firsts to do it

Organisation sponsors:
Questions to Be answered

- Evaluate Feed
- Better Estimation of Fish Number and Average Weight
- Evaluate production strategies
  - Grading or not
  - Frequency of net changes
- Evaluate Feeders
  - Get optimum feeding rate
- Detect kpi’s change between years and production life cycles
- Identify variation from models and analyze causes
How can aquaSmart Analytics help answer those questions?

What happened  Why  What will happen

AQUASMART

Organisation sponsors:
Example: Evaluation of different hatcheries in terms of FCR. Hatcheries 1 and 4 have the same average but 4 is unpredictable!

Same mean FCR

Different variability
Descriptive Statistics & Visualization/2

Example: scatterplot showing the relationships between all parameters affecting the main KPIs.
Should we have changed to food type (bigger pellet size) sooner? Let's say in 60 gr?
Is there a pattern in Mortalities? Hatchery 3 seems to be problematic.
Advanced Machine Learning algorithms: descriptive data mining

- Descriptive Models
- Understand Relations
- “Why it Happened”

Organisation sponsors:
Advanced Machine Learning algorithms: predictive models (neural network example to predict size distribution in harvesting)
Approach to Standards

1. Liaise with ISO WG 9
2. Develop Business Plan for CEN Workshop on Big Data
3. Create a draft CWA (CEN Workshop Agreement) for Big Data in Aquaculture
4. Present draft CWA to Stakeholders for comment
5. Produce CWA for Aquaculture
Thank you for your attention!

We will be happy to hear from you!

If you have any comments, ideas or you would like to be involved in aquaSmart, please send us an email at:

research@aqua-manager.com

Organisation sponsors: