

Big Data Transformation in Aquaculture

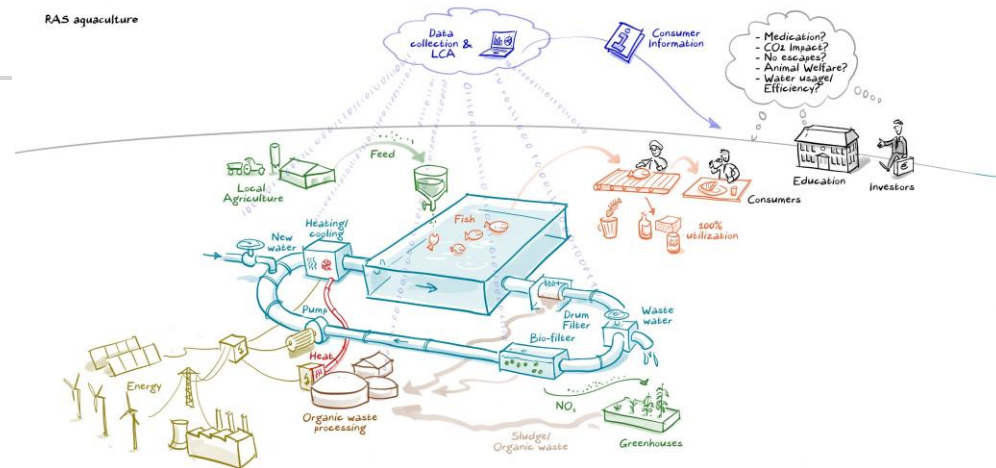
How Big Data Drives Technological Innovation

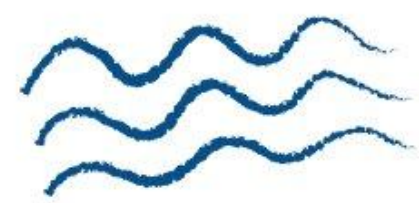
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Big data refers to large and complex sets of data that are difficult to collect, store, process, and analyze using traditional data management tools or methods.

It's not just about *size* — big data is defined by several key characteristics often summarized as the “**5 Vs**”:

Volume – The sheer amount of data being generated (e.g., terabytes or petabytes from social media, sensors, transactions, etc.).

Velocity – The speed at which data is created and needs to be processed (e.g., real-time streams from IoT devices).

Variety – The different types of data: structured (databases), semi-structured (JSON, XML), and unstructured (text, video, images).

Veracity – The reliability and accuracy of data; big data often includes “noisy” or uncertain information.

Value – The potential of the data to generate insights or business benefits once analyzed

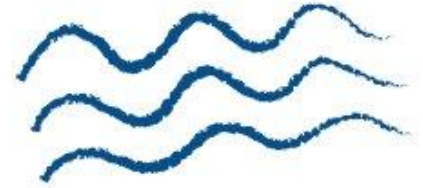
Introduction to Big Data in Aquaculture



Big Data in aquaculture refers to collecting, analyzing, and applying large volumes of data from sensors, IoT devices, feeding systems, and environmental monitoring.



Enables better management, sustainability, and decision-making in fish farming operations.



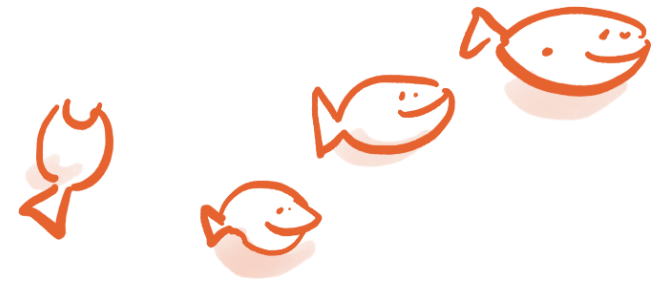
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Smart Farming (Precision Aquaculture)

Using **IoT devices** and **AI analytics**, farmers can monitor real-time conditions in ponds or cages.

Data-driven automation adjusts **feeding rates, oxygenation, and water flow** automatically.

This reduces waste and improves growth rates.

Example:

If oxygen levels drop, a smart system activates aerators before fish are stressed – minimizing mortality.

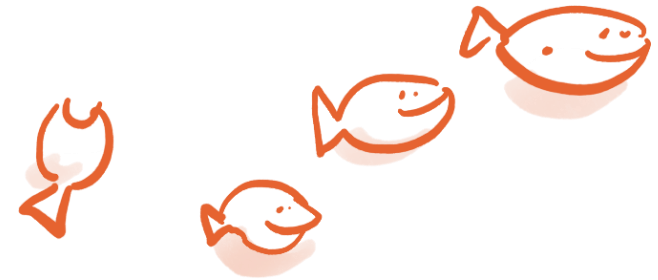
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Predictive Analytics for Fish Health

Big data models can **predict disease outbreaks** by analyzing environmental changes, feeding behavior, and historical trends.

Early warnings enable preventive actions, reducing the need for antibiotics and saving stock.

Example:

Example:

AI systems in salmon farms detect early signs of sea lice infestations using image data from underwater cameras.

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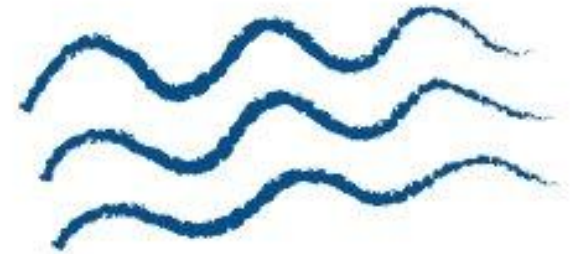
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Sustainable Resource Management

Data helps optimize water and feed use, improving resource efficiency.

Analyzing patterns across farms reveals **best practices for sustainability** and **reduces environmental impact**.

Example:

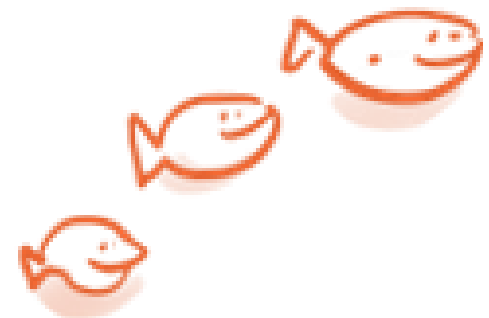
Comparing data across regions can show which farms use less feed per kilogram of fish, promoting eco-friendly operations.

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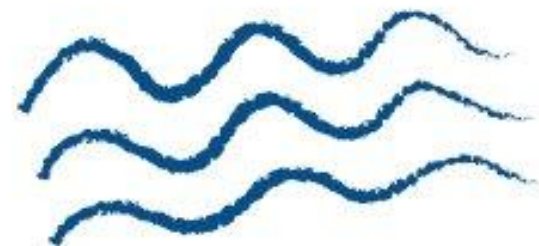
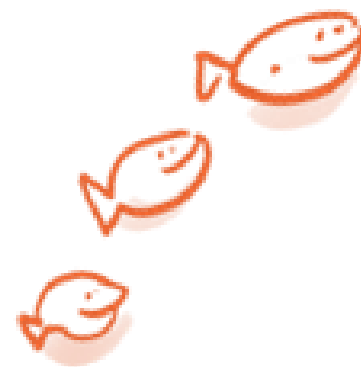
Supply Chain and Market Intelligence

Big data integrates production with **supply chain and market data**, improving logistics and pricing.

Predictive analytics forecast **demand trends**, helping producers time harvests for higher profits.

Example:

Retail and consumption data can guide when to harvest shrimp or tilapia to match peak demand in export markets.



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Technological Transformation Through Big Data

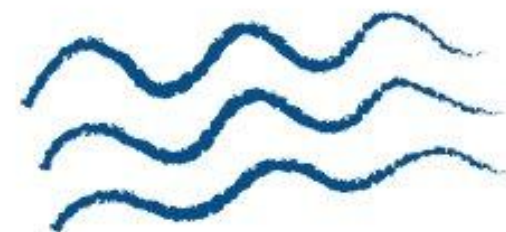
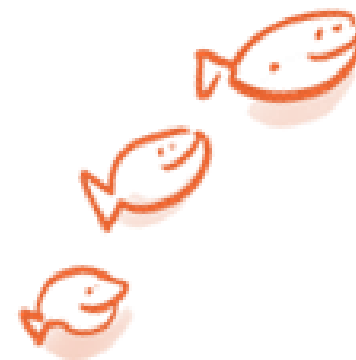
1. Smart Farming (Precision Aquaculture): Real-time monitoring and automated feeding.
2. Predictive Analytics: Early detection of diseases and stress conditions.
3. Sustainable Resource Management: Optimizing feed and water use for eco-friendly operations.
4. Supply Chain Integration: Data-driven logistics and market alignment.

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Big Data and Business Innovation

New Business Models

Data-as-a-Service: Companies can sell or share data insights (e.g., environmental monitoring platforms).

Subscription-based analytics platforms for small-scale fish farmers.

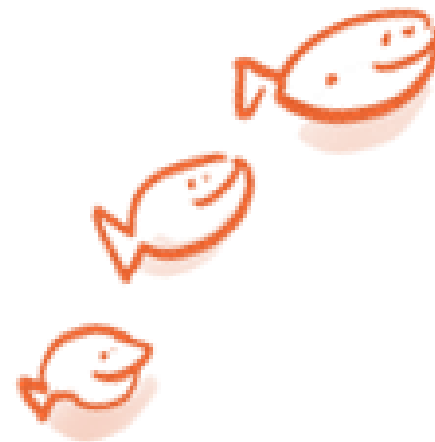
Enhanced Product Traceability

Blockchain + big data ensure **full traceability** from hatchery to plate.

Builds consumer trust and meets global sustainability standards.

Personalized Nutrition and Breeding

Using genetic and feed intake data, companies can create **custom feed formulas** and **optimized breeding programs**, improving productivity and quality.

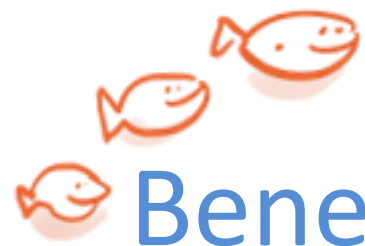


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Benefits of Big Data in Aquaculture



Improved productivity
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Enhanced sustainability
and reduced
environmental impact.



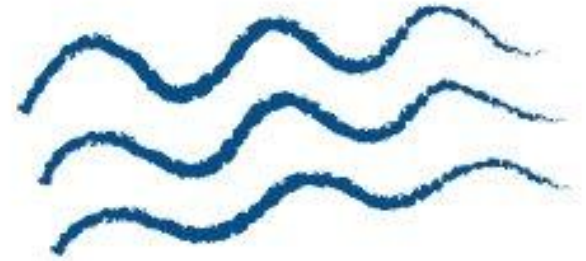
Better disease
management and animal
welfare.



Increased profitability
and competitive
advantage.

Conclusion

Big Data transforms aquaculture from traditional farming into a smart, connected industry. It fosters technological innovation, sustainable growth, and data-driven business models, ensuring long-term profitability and environmental stewardship.



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