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Record keeping and data management for the hatchery

Edgar O. Oviedo-Rondón

Prestage Department of Poultry Science, North Carolina State University

Hatcheries are part of the poultry supply chain and produce lots of records and data.

Generating data always has a cost. There is no value or return unless it can be transformed into real-time information to be used in better decision-making and actions to control variability and improve the process.

We can use data to generate reports and create books of historical data with descriptive statistics of the process. We can use this data to compare standards or benchmarks with company or historical standards, recommendations, or other hatcheries and companies.

However, we should also use the data to control the process, predict issues, plan better, and prescribe solutions.

Learning objectives

The objectives of this module are:

1. To understand the purposes of hatchery data records.

2. To learn what is data quality and how to improve it.

3. To learn how to organize and classify data by egg origin, hatchery management, hatchery performance.

4. Learn how to use process control statistics and do data analytics.

5. Introduce the Jamesway 360 tool for data management and analysis.

The purposes of obtaining hatchery data are:

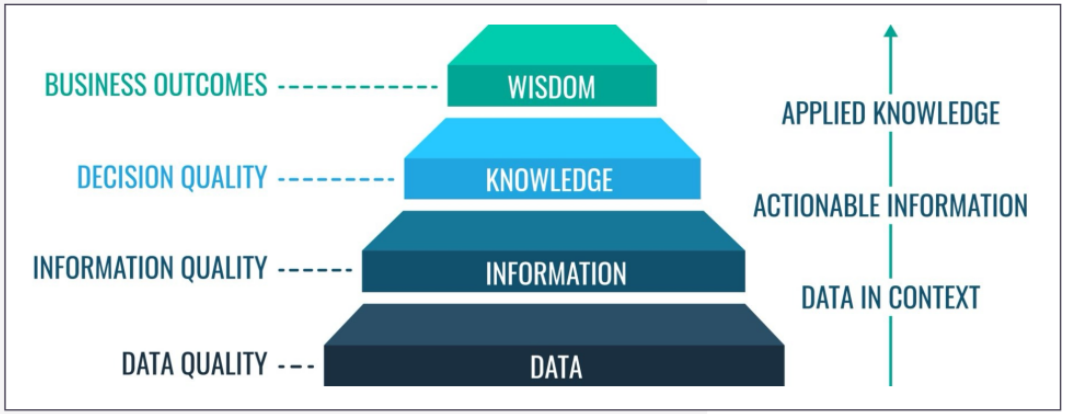
- Improve management decision-making, evaluation, and benchmarking
- Production control, logistics, and process improvement
- Enhance compliance with personnel and facility safety
- Keep records and improve animal welfare and biosecurity programs
- Keep track of room and machine management and maintenance
- Control vaccine application and quality
- Early detection of potential issues
- Planning: short, mid, and long-term flows and maintenance
- Monitoring Standard Operation Procedures
- Troubleshooting issues, detect and quantify cause and effects
- Developing specific performance standards
- Monitoring trends

Data records can help with the evaluation of:

- Equipment investment
- Maintenance practices
- Changes in management procedures
- Egg providers, egg quality
- Chick transportation and quality delivered

Data quality

The foundation of all data-driven processes is the quality of the data.



Data quality can be transformed into actionable information, knowledge to improve decision quality, and applied knowledge to achieve positive business outcomes.

To use data effectively, **it is necessary to digitalize all records as soon as possible for faster and better analysis.**

The circle of growth through digital process automation includes discovering the points where data can be digitalized, improving and personalizing the data collection within the workflows, implementing digitalization within the processes, refining the goals, and monitoring the process to make sure goals are met. **Poor-quality data will cause poor-quality results and decisions.**

Data quality includes accuracy, completeness, relevancy, validity, timeliness, and consistency. These traits can be detected when the data can be visualized. Examples are given for infertility or fertility in broiler breeder flocks and leghorn line flocks.

Quality data is clean, prepared well, free of errors, not missing information, and must cover the questions being asked.

Data should be chosen to avoid irrelevant or confusing data. Data must be collected in a valid way to be credible, and it must be workable and usable by business users.

Hatchery data organization

Hatchery data can be organized in databases with as much descriptive information as possible. **The more information each observation has to describe it, the better to understand the process and investigate issues or improvement methods.**

The main factors to consider are:

1. EGG ORIGIN:

- **Breeder flock:** ID #, Genetic line, Age, Farm, Location, House #, room.
- **Inventory numbers and categories:** #set, #hatch, #1st quality, #2 quality.
- **Process flow:** Lay date, Hatchery reception date, Set date, Hatch date (storage time).
- **Egg management:** Sanitation, Temperature, Relative humidity, and CO_2 during storage, pre-warm.

2. HATCHERY MANAGEMENT:

- **Rooms:** ID, Air pressures, plenum pressures, halls, calibration and alarm logs.
- **Machine:** Setter and Hatcher ID, Temperature, RH, CO_2, Turning, ON/OFF – Heating/Cooling cycles, Calibration, and alarm logs.
- **Boiler and Chiller:** Temperatures, efficiency.
- **Generator run log.**

The responses or hatchery performance key indicators to observe in the data depending on the previous factors are:

- Egg moisture loss
- Hatchability and hatch of fertile
- Residue breakout, mortality by period, malformations
- Candle breakout
- Fertility
- Results of sanitation
- Hatchling quality, hatch, and culls, saleable chicks, grade A
- Hatchling livability and performance (3 and 7 days)

Data origin

Important data is obtained from embryo diagnosis evaluation. However, this should be organized.

Data can be recorded in simple forms that distribute between basic infertile, early, mid, and late mortality, cracks, inverted, and culled chicks. However, the analyses can include more details like contamination, mortality by specific age periods, types of malformation, or other causes of death.

The more details that can be recorded, the better troubleshooting problems will be. However, the extra time and knowledge required to collect more detailed data must be considered. The evaluation parameters must be consistent across time.

It is important to calculate the detailed information collected in an embryo diagnosis and combine this information with diverse parameters of the machine and room management to observe tendencies.

When analyzing hatchery data, it is essential to remember that many responses will depend on the age of the hens.

Nowadays, hatchery data comes from multiple sensors in the machines and equipment used to set, monitor, and manipulate eggs. This data is massive and detailed.

Machines transfer eggs from the cool room to trays for incubation or from setters to hatchers, and the *in-ovo* vaccination machine reviews all trays and eggs. This data and all data loggers placed in a machine contain valuable information that should be analyzed.

How to use data

Data analyses are more effective when data from diverse sources are integrated.

Data can be integrated using Excel software to create pivot tables. The data must be organized to generate averages per breeder flock age and have all possible statistics to describe the observations. Excel pivot tables offer this possibility, but generally, only average values are presented.
Often, the issues and opportunities for improvement are in the data dispersion or the variability of the results.

It is advisable to use data analytics software and not only Excel to analyze some data that is more variable and multidimensional. Multidimensional means many different features or attributes, and numeric values are not always used to measure them. There are many software options available in the market. We will discuss mainly with R Studio, which is free, and JMP from the SAS Institute.

Data Analytics

Data analytics is the broad field of using data and tools to make business decisions. It includes the data analysis for a specific process.

The process of data analytics includes:

1. Collecting the data

2. Visualization of the information to determine the quality and structure of the data

3. Analyzing the data to summarize and detect issues and root causes

4. Determining and implementing improvement actions

5. Controlling the production system again by collecting new information.

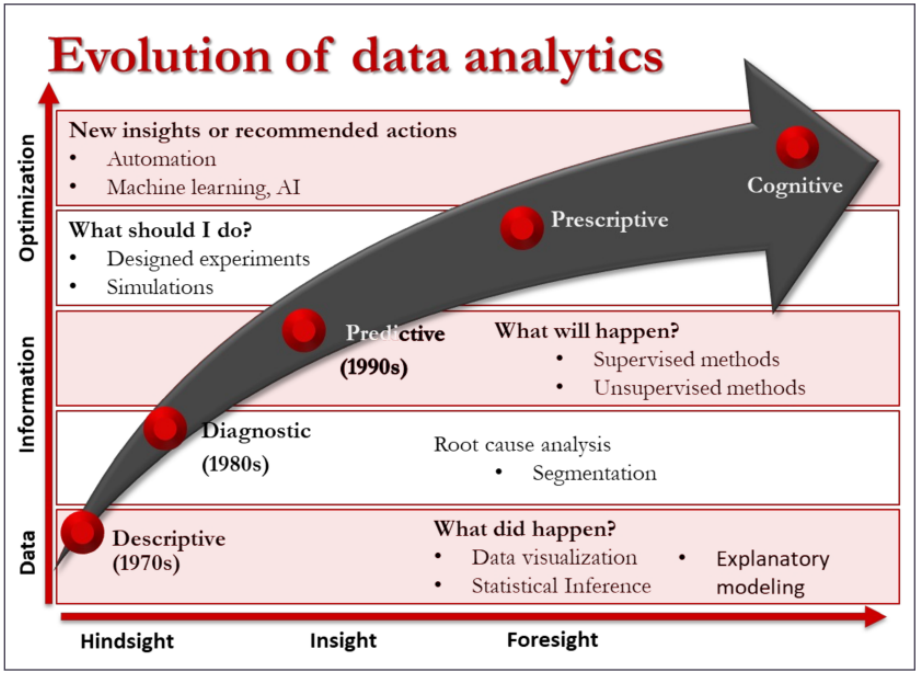
Evolution of data management

Data utilization has evolved throughout the years, moving from hindsight or understanding the results of process situations or events only after they happened or developed to providing insights to deeply understand the incubation process and the cause and effects of the process.

Lately, it will foresight or create the ability to predict what will happen if the current conditions are maintained.

Since the 1970s, most data has been used only to describe what happened and obtain historical reports. Lately, it has been used for root cause analysis and is becoming more practical when predicting what will happen in simulations.

The latest applications are needed for automation, machine learning, and artificial intelligence. This evolution is happening in the hatchery equipment, and we must understand the different uses that we can give to data. The application of the different techniques only requires more skills in data analytics.



Data Analytics for Process Control

To improve a process like incubation in a commercial facility, it is important to integrate data and establish relations.

It is also important to classify, cluster, and detect the limits of intervention. Finally, it is important to establish cause and effect, predict, and prescribe solutions for improvement.

There are methods designed to achieve all these goals. For example, you can group egg storage (egg age) pre-incubation by ranks of data and observe its distribution. The distribution can give you an idea of the groups that should be treated differently during incubation. Depending on egg storage days, certain managements like SPIDES may work better than others.

Looking at the evolution of early, middle, and late embryo mortality as breeders age can give you an idea of where the issues with incubation are that need improvement.

In this way, **you can apply statistical problem-solving, which includes identifying the problem, determining a cause or possible root causes, determining solutions, and controlling key indicators of the process to sustain the results.**

Among the data analytics techniques, control charts are essential to determine:

- **Is a process stable or not?**
- **Basic level of performance for each parameter or indicator**
- **Process variability**
- **Process problems**
- **Process improvements**
- **Improvements that keep over time**

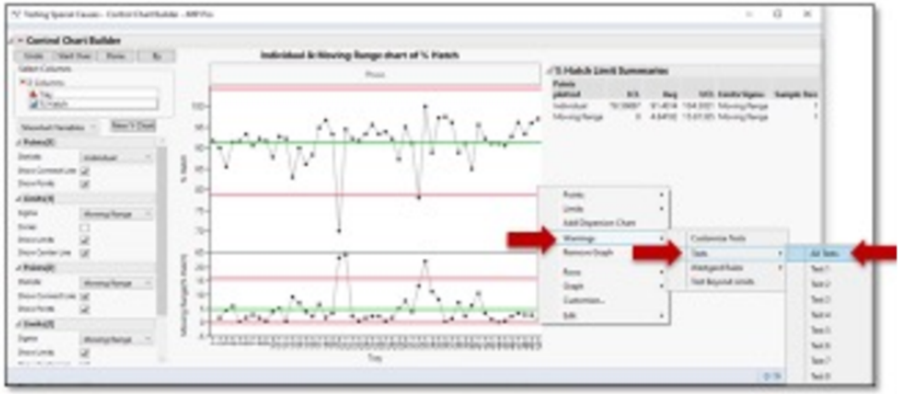
The control chart generally contains data organized in a timeline, with the objective of understanding and studying the behavior of the production system over time. Depending on how that indicator moves, stable, unstable, and systematic variation can be identified.

The systematic variation must be identified to intervene and solve issues.

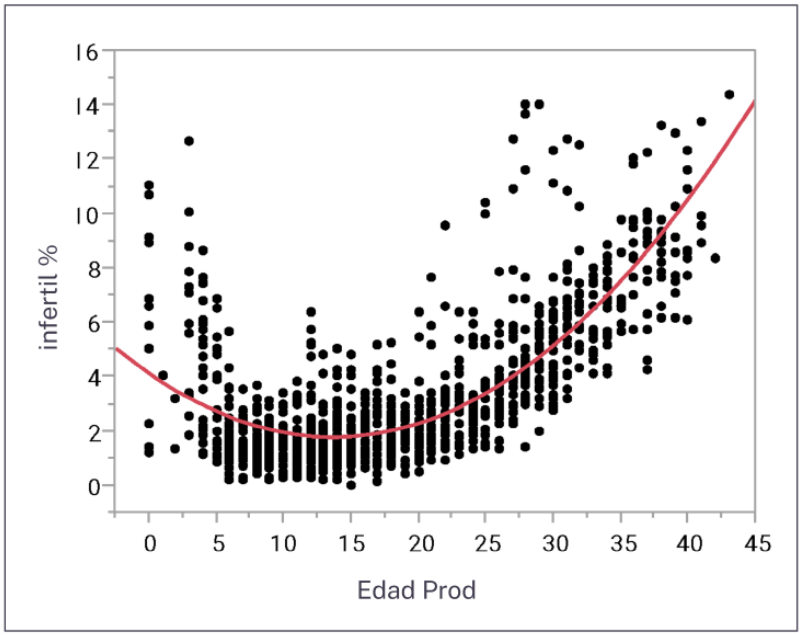
Test rules process **Testing for special cause variation**

1| Create an Individual and Moving Range chart

2| Secondary click, Warnings, Tests, All Tests

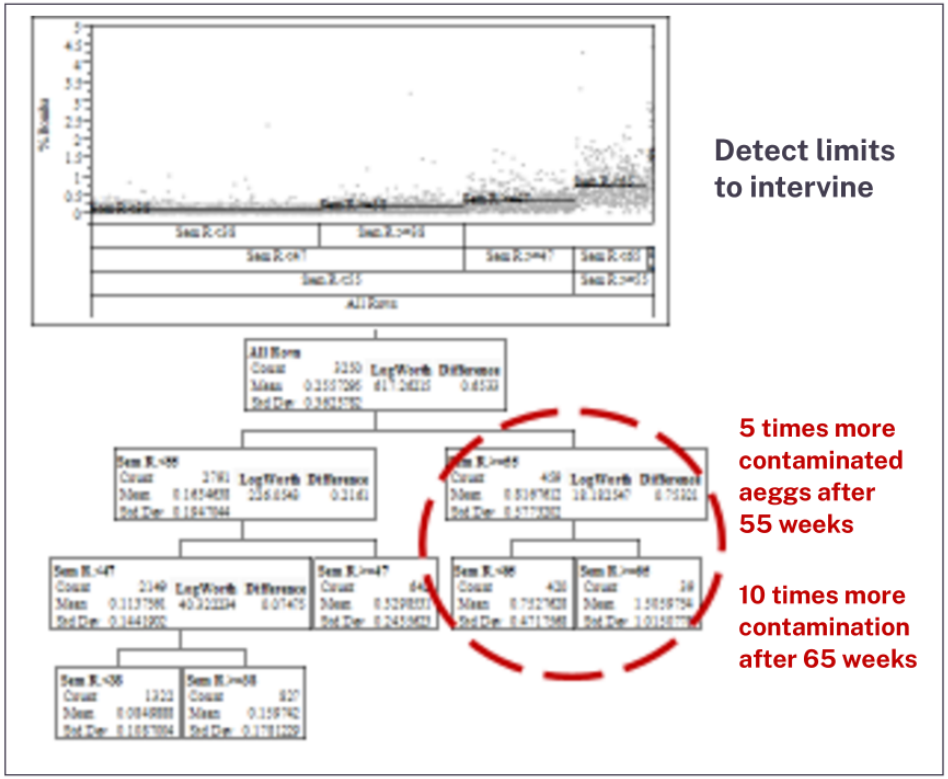


The control charts set the upper and lower limits of performance and the centerline or average performance. Data analyses can help detect special causes of variation. This technique and others, like regression, can help predict problems that can start occurring, such as when fertility issues or early mortality start happening in a company according to breeder flock age.



Techniques like decision trees can help detect limits to intervention. For example, in this case, the eggs are five times more contaminated starting exactly after 55 weeks, and the contamination doubles by 65 weeks of age across all flocks in a company.

These and many other techniques are available in statistical software. They should be applied to hatchery data when the goal is to seek further improvements in the hatchery management processes.



Hatchery software

Software provided by hatchery equipment companies is evolving to manage all the data.

Jamesway created 360, a new platform building on existing data. It tracks breeder information, transport checks, arrival and storage information, incubation data, hatchability, chick quality, and farm performance. As you see, this platform integrates diverse databases common in poultry companies that are generally separated.

The 360 imports existing Hatchcom and Maestro information and provides all machine information at a glance. It also provides metrics to streamline hatchery operations and forecast maintenance.

The 360 Track can help organize egg flow, plan and manage egg batches entering the facility, and organize egg inventory. Once the platform manages all this data, diverse analyses will be possible later on. Integrating egg data and flock data makes possible to conduct some of the analyses that we reviewed in this module with statistical software. That is the power of combined hatchery data.

Conclusions

- Hatchery data is critical for proper decision-making.
- Guarantee data quality is critical in this process.
- Excel is a good tool, but data analytic software can provide more tools for planning, process control, prediction, and prescription for improvement.
- Data visualization is always the first step in analysis, and many data analytics methodologies can explore points of control and potential improvement.
- 360 software is a key tool for data hatchery management.

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Thank you!

Grupo de Comunicación Agrinews S.L.

Avinguda de Jaume Recoder, 17, 08301 Mataró,
Barcelona (España)

info@grupoagrinews.com

Tel: +34 93 115 44 15