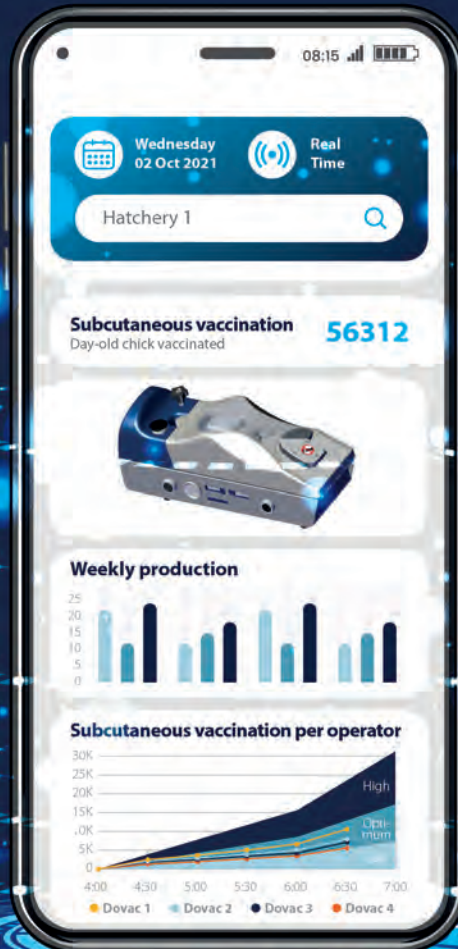




NEW HATCHERY DATA SOLUTIONS FOR SMART DECISIONS

How new data solutions can help poultry hatchery producers in their day-to-day activities



Ceva Hatchery Connect

Empowering your decisions at the hatchery

DATA SCIENCE IS THE FUTURE FOR POULTRY PRODUCTION

We are living in the age of data. Data collection and analysis, and enabling data-based decision-making processes, has become a day-to-day activity for almost every industry worldwide. The global poultry production industry is no exception and in recent years has increasingly entered this data-rich ecosystem.

Hatcheries, as a key element of the poultry production chain, are therefore getting more and more connected to data processes. The decision-making processes at the hatchery are becoming more data driven, and less based on the traditional expertise of the hatchery manager.

Decision making at the hatchery affects almost all the different production steps. From storage, to incubation, chick processing and expedition processes, all are strongly linked to data indicators and continuous feedback. The benefits of good analysis of production data enabling better decision-making could be massive for the poultry hatchery industry, which is moving towards ever tighter margins and operational profits. For example, improving the hatchability level by 0.5%, or saving 5% of the yearly energy costs, or reducing by 2% the first week mortality rate due to better chick quality, are all extremely beneficial scenarios for a hatchery manager. These types of outputs are now more likely to be achieved due to data science at the hatchery.

The automation of data collection from all the different equipment and sensors in the hatchery is crucial for this purpose. Monitoring all the processes in real time can now be achieved with modern automation equipment.

Some examples are the new smart candling machines such as Smart Laser Life®; Ideal In Ovo Vaccination lines with Egginject®; chick processing room devices; egg reception devices like Ovosense®, etc... all of them able to be connected in real time. On top of the data collection, having some powerful and automated systems in the background to consolidate and analyse all these data and indicators is pivotal to be able to access an enhanced decision-making process. Today, with real-time data collection and analysis, modern hatchery managers can access all the information from the hatchery process, via mobile phone or web-based platforms, and be able to take the best decisions, in a quick and efficient way, anywhere, anytime. The results of taking data-based decisions can only be beneficial and extremely efficient compared with traditional methods.

In this booklet, I invite you to explore all our different new solutions and applications, and the implications that this new era of data science, connected equipment and fact-based decision-making processes could have for your hatchery and farm production.

Join me and discover how Ceva Smart Solutions could help you in this data-driven journey to the future.



CARLOS GONZALEZ

*Global Marketing & Sales Director
Smart Solutions, Ceva.*

HATCHERY AUTOMATION: TODAY'S ANSWER TO THE NEEDS OF TOMORROW



VALENTIJN CRUM

*Technical & Sales Manager, Corporate
ECAT-ID Hatchery Technology, Ceva.*

KEY POINTS

- Automation offers modernity to face new challenges.
- High-speed solutions to optimise hatchery outputs.
- Non-operator dependent solutions to ensure consistent quality.

Poultry production drastically changed during the past years to adapt to new production challenges. The COVID pandemic has stressed these changes and accelerated poultry chain evolution. It is particularly true talking about hatcheries.

Worldwide, hatcheries adapt their processes to answer new market challenges.

MODERN HATCHERIES ARE BUILT TO OVERCOME MARKET CHALLENGES

During the last past years, there was a consolidation of poultry production globally. To optimise cost and risk management, hatchery production is now concentrated in less hatcheries but with bigger production capacity.

When in 2016, a large number of hatcheries was producing between 200,000-500,000 eggs per week; new hatchery projects are now between 1.5-2.0 million eggs per week. Obviously, these production changes are highly driven by the new challenges that hatcheries need to face:



• High performance and output rates:

With the consolidation of production, modern hatcheries need to increase their capacity and production volume. To maximise their volumes, hatcheries must adapt their current production process, by maximising the output rates.

• Limited task force:

Traditionally, producing more is synonym of more people. Paradoxically, it is increasingly complex to find people. In general, agricultural productions like hatcheries are suffering from high turnover, complicating the day-to-day activities.

• Need for hatching egg quality:

Maximising hatchery capacity is not enough, the quality of the egg is also critical. All single details count to optimise cost production. A good egg quality limits the contamination at hatch, improving chick quality and reducing first week mortality.

During the last years, these three majors challenges have driven hatchery automation modernisation to overcome them.

HATCHERY AUTOMATION INNOVATION: AN ANSWER TO THESE CHALLENGES

Indeed, hatchery automation benefits are multiple. It helps to:

- Increase production rate with high-speed solutions.
- Limit the impact from the operator in the process.
- Improve egg and chick quality.

HIGH SPEED SOLUTIONS

To face production volume increasing, the only cost-effective solution is the full automation of hatchery production. To absorb higher quantities of eggs and day-old-chicks processed during the same period, manual steps must be limited to ensure process efficiency and economical reliability.

For instance, the simple installation of a stacker or destacker into an existing transfer prevents tray or basket handling becoming the bottle neck in the process. Line speed will reach more than 60,000 to 90,000 eggs per hour with an impact of 0.05% average egg breakage, versus 2-5% average with manual handling.

DECREASE OPERATOR AVAILABILITY DEPENDENCE

The availability of skilled operators is becoming a major challenge to operate hatcheries. High operator turnover is observed, independently from the region in the world. Introducing automation at the hatchery can help to secure hatchery processes which are manually performed.

A good example is the identification of upside-down eggs at the egg reception room. This step used to be done manually in many places. More and more hatchery managers are automating this quality control process to ensure better results independently from the availability of skilled operators. It is worth knowing that 1% upside can represent €170,000 of upsides sales for a hatchery setting of 60 million eggs per year.

Fig. 1. Contamination and rotten eggs.

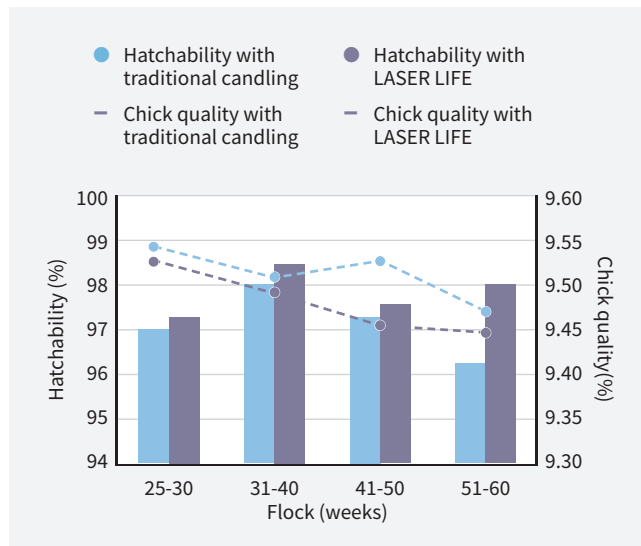
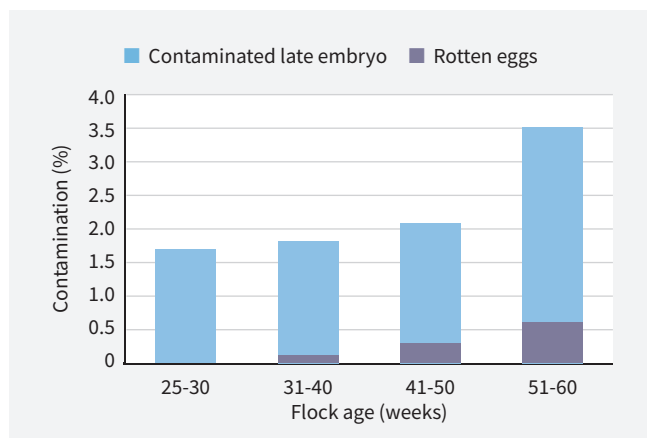


Fig. 2. Hatchability and chick quality with Laser Life.

Technology, such as Ovosense®, automates identification of upside-down eggs before incubation giving a chance to 100% of the fertile eggs to produce a good day-old-chick. At reception from breeder farm, egg trays go through Ovosense®, located inside the egg reception room, and each egg is scanned individually to identify the orientation. In case one of the eggs is not set properly, Ovosense® will colour mark it to allow a correct setting.

BETTER EGG QUALITY

Egg quality is the main factor influencing the incubation process, especially when in ovo vaccination is conducted. Low bacterial load and a good quality eggshell are paramount to success. Even if many practices aim to maximise the sanitary status of production, the older the flock is, the more porous and thin the egg shells will be.





Therefore, eggs are more susceptible to contamination, and consequent generation of explosive eggs. As a result, late embryo mortality will increase, and hatchability and chick quality will decrease. In this context, automation solutions such as smart candling devices is essential to maintain quality standards during the incubation process. During the past years new candling technology appeared on the market, not only to identify unfertile eggs but also to segment the different egg categories at transfer.

Laser Life® identifies and removes middle-dead embryos, late-dead embryos and contaminated eggs at transfer. The removal of dead embryos and contaminated eggs at transfer leads to less contamination in the hatchers. This will positively impact at each hatchery, based on their processes and conditions, leading to hatchability improvement, better chick quality and lower first week mortality.

Hatcheries are in permanent evolution to face market pressure and challenges. The permanent race to stay economically and technically competitive force modern hatcheries to embrace innovation among the production process. Automation and hatchery technologies contributed during the past years to answer poultry production's main challenges as human resources availabilities, increasing of production sizes or the need to get and secure better meat quality.

Within many hatcheries across the world, there is still room for improvements among the criteria mentioned previously.

The next wave of innovation has already started in the poultry industry, including automation devices: data collection and data science.

OVCsense®
EGG SETTING ANALYZER

Do you know the cost of 1%
upside-down eggs?



IMPORTANCE OF DATA MANAGEMENT AT THE HATCHERY



MIREN ARBE UGALDE
Corporate Vaccination Services &
Equipment Director, Ceva.



CARLOS GONZALEZ
Global Marketing & Sales Director
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KEY POINTS

- Data analysis can easily help poultry producers to optimise their results.
- Hatchery modernisation in equipment and services enables this data management dimension.

DATA COLLECTION AND DATA ANALYSIS

Data collection and analysis can help hatcheries to increase their performance and optimise the decision-making process. Today, due to modern equipment and services in the hatchery, data can be collected, and indicators can be monitored in a consistent basis, to achieve a better decision-making process.

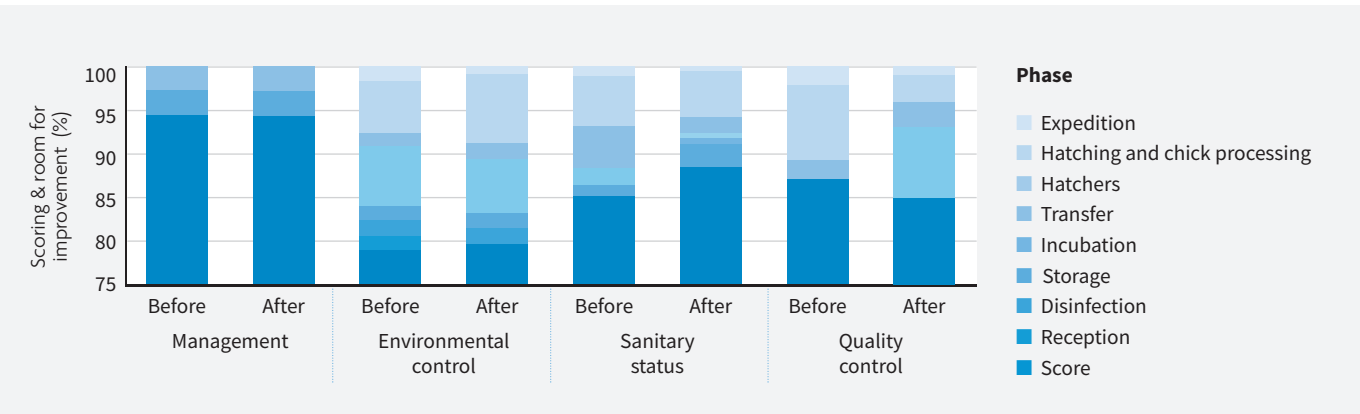
As an example, illustrating the potential benefits of data monitoring, a global analysis was carried out in a hatchery in

Europe, together with Ceva’s C.H.I.C.K. Program implementation, where all processes within the hatchery were monitored and analysed (Fig. 1).

The analysis of the data obtained, allowed the company to identify the existing points for improvement and to focus resources on those areas with the highest impact on production, establishing action plans for each of them. After implementing all the corrective measures, the status of the hatchery was analysed again. The score obtained showed a significant improvement versus the initial status.

This type of global analysis can be carried out at specific moment, when the aim is to obtain a picture of the real situation of a hatchery in a given time. However, the real benefit of data analysis comes with regular and continuous monitoring of the indicators, that allows to know the evolution of the key parameters through a long period of time.

Fig. 1. Comparative global analysis before and after implementation of improvements.



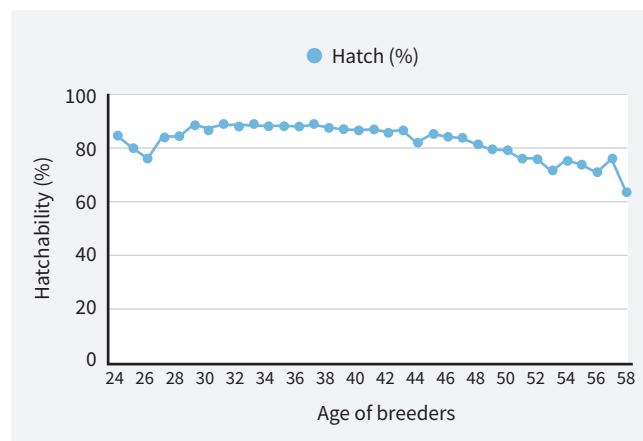
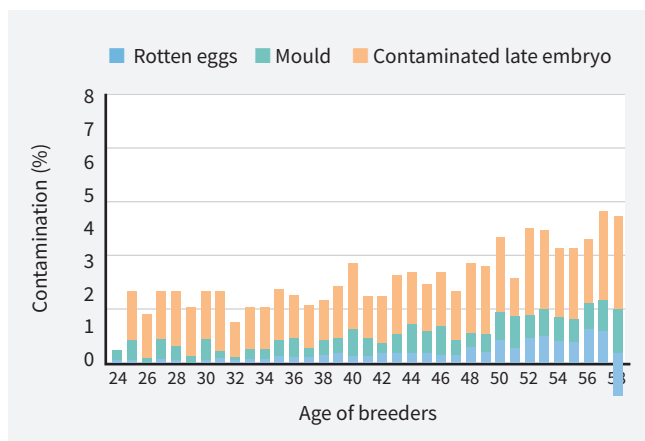


Fig. 2. Contamination and hatchability. The higher the egg contamination, the higher the negative impact on hatchability and chick quality and the higher the antibiotic usage and first week mortality on the farm.

Thanks to this type of continuous monitoring, hatchery managers can quickly detect deviations and act immediately to correct the situation. Also, when important decisions need to be made, like hatchery investment, modernisations, etc., this data analysis of historic periods can help a lot in the process.

Today, hatchery technologies such as automation and vaccination equipment are able to collect and communicate data in real time. Through some concrete examples of hatchery practices, this article illustrates the importance of proper data management.

GOOD EXAMPLE: MONITORING HATCHERY CONTAMINATION

Hatching egg quality monitoring might be a good example of how important proactive data analysis brings added value. It is well-known that the older the flock is, the more porous and thinner the eggshells are.

Therefore, eggs are more susceptible to contamination and the generation of explosive eggs. As a result, late embryo mortality will increase, and hatchability and chick quality levels will decrease.

The latest development in candling technology, Laser Life for instance, counterbalances this situation by identifying and removing more categories compared to standard candling. Now, middle-dead, embryos, late-dead embryos and contaminated eggs transfer are removed, in addition to infertile and early-dead embryos.

The removal of dead embryos and contaminated eggs at transfer leads to less contamination in the hatchers. Performances at hatch are improved: better hatchability and chick quality. By collecting this data, in an automatic way by the equipment, and analysing it, the hatchery manager can take fact-based decisions to improve the results (Fig. 2)

Contamination and hatchability. The higher the egg contamination, the higher the negative impact on hatchability and chick quality and the higher the antibiotic usage and first week mortality on the farm

CONTINUOUS MONITORING

Following the previous example, by monitoring the eggs removed by category, hatchery managers can quickly detect a deviation on expected performance results. As hatching-egg quality directly affects chick quality, and chick quality directly affects field performance, a corrective action taken at the hatchery level would have large implications during the flock growing and slaughter results.

If, based on the data collected by the automation device, hatchery managers can reduce the number of hatching eggs belonging to these unwanted categories, field performance could be improved almost immediately. Thanks to the collection of data, companies have a clear and real point of reference of the hatchery's production and the processes that are carried out, representing a competitive advantage that allows hatcheries to stay ahead of market trends.

EMPOWER DECISIONS AT THE HATCHERY: CEVA HATCHERY CONNECT



WILLIAM BOYER

Marketing Manager, Digital & Smart Solutions Accelerator, Ceva.

KEY POINTS

- Current hatchery data management is very manual.
- Hatchery data management system must collect, centralise data and decide.
- Ceva Hatchery Connect: a real time monitoring of vaccination process and historical analysis to optimise hatchery performances.

HATCHERY DATA MANAGEMENT: A MANUAL PROCESS

Despite the large amount of information circulating inside any hatcheries, the collection of information from the egg reception up to the day-old-chick expedition is still very manual. In most hatcheries, eggs entering are identified via paper form completed manually by an operator with all important contextual information such as the farm origin of breeder flock information. Once completed, this paper form reaches the rest of the forms on the desk of the hatchery manager.

Paradoxically in this low-tech data collection process, hatcheries must comply structural needs where proper data management should play a critical role. Indeed, the daily collection of information performed at the hatchery must guarantee:

- Precise hatchery process traceability: to track accurately the different steps and production parameters from egg reception up to the day-old chick placement.
- Simple day-old chick order management: to manage daily day-old chick placement into broiler farms and the eggs stored availability.

- Detail hatchery activity reporting: to get a daily and historical overview of each hatchery step.

Moreover, a new generation of incubator technology is helping more and more to collect and centralise incubation programs and hatchery process. However, incubation process is not the full hatchery process and some critical steps, such as the egg transfer, for instance, are missing.

So today, hatchery data collection systems represent major risks:

- Manual collection can be a source of error: operator filling paper form in by mistake with wrong information.
- Information is not available when it is needed: time availability is already a major constraint for every single hatchery manager. Digitalising every paper form to make it available for analysis and hatchery optimisation is not the priority.
- Performance optimisation across poultry is not possible: as there is no proper consolidation of information at the hatchery, the exchange for added value among different production units (breeder farm, farm, slaughter) is complex.

COLLECT, CENTRALISE AND DECIDE

To answer hatchery challenges, the data management solution for any hatchery has to:

1. Collect information from the different area of the hatchery, taking into consideration building constraints and the different machines which can deliver information.
2. Centralise via a secure system all the hatchery process information collected on a daily basis.
3. Help hatchery managers to decide, based on a real time overview of the hatchery process and historical analysis.

Based on these three key concepts, Ceva has developed an innovative data system designed to support hatchery managers the monitoring of day to day hatchery operations with: Ceva Hatchery Connect.

To run a Ceva Hatchery Connect project inside a hatchery three elements are required:



1. Ceva Connected Equipment: by connecting a selected range of Ceva equipment present in different hatchery processes, hatchery managers will get access in real time to the critical production information like the quantity of egg candling, vaccination speed per operator or the quantity of crates ready for shipment.

2. Ceva Box: all the information shared in real time by each equipment are centralised inside the hatchery into a highly secure system called the Ceva Box. The role of this device is critical as it will collect the information from all the hatchery equipment and transfer it automatically to an online database

3. Online platforms: to facilitate the decision-making process of the hatchery manager, two different visualisation platforms have been created for two specific needs. In one side, the hatchery manager will access via its mobile phone to the real-time overview of its hatchery processes. Depending on the devices connected, the hatchery manager will see the status of the day of the transfer process, or the quantity of day-old chicks hatched since the start of the production. On the other side, via a unique web portal, the hatchery manager will get access to all the historical performances.

With a few clicks, get insights on main hatchery trends and process optimisation. By combining the latest technology to allow hatchery manager to monitor in real time the vaccination process and identify hatchery process optimisation.

REAL TIME VACCINATION MONITORING: IMPROVE REACTIVITY

By getting the latest news from the chick processing room, chick placement to the farm can be organised in advance. Being alerted that the last cleaning cycle of the in-ovo vaccination machine occurred only the day before, allows managers to take immediate action to limit the impact of contamination.

HISTORICAL ANALYSIS: OPTIMISE HATCHERY PERFORMANCES

Hatchery practices are under permanent changes to adapt to the market needs, egg quality, microbiological risks... Monitoring hatchery production parameters daily is not enough. Deep understanding of historical performances at each step is critical to identify deviations and make corrective actions or to optimise process.

For instance, having access to the historical subcutaneous vaccination outputs per operator helps improving vaccination speed efficiency and homogenous speed per operator every day. In case output variation is observed, maintenance of the machine or dedicated operator training can be scheduled.

One other example could be related to the candling data. With new candling technology such as Laser Life, the egg categories identified are broader: infertile, early dead, rotten... Having access to a consolidated database of egg categories quantity per flock help to forecast hatch quality and to improve egg quality received from breeder farms.

No doubt that in a few years hatchery process will be fully connected. The mastering of hatchery information is critical to ensure technical and economical sustainability. This path has to start today with the connection of some key existing equipment of hatchery processes.

Ceva Hatchery Connect has been developed to answer hatchery manager challenges bringing a real time monitoring of vaccination process and historical analysis to optimise hatchery performances.



IMPORTANCE OF VACCINATION QUALITY FOLLOW-UP



ELIA PEREZ CANYELLES

Corporate Vaccination Services and Equipment Manager, Ceva.

KEY POINTS

- Protection starts at the hatchery.
- High vaccination quality requires regular control.
- Close follow up of vaccination quality brings extra-value among poultry organisations.

PROTECTION STARTS AT THE HATCHERY

In such a competitive sector as poultry farming, profitability, or even viability, comes from optimising production costs, accompanied by obtaining a quality product at the end of the process. In order to achieve optimum production results, one of the key points is the control of recurrent pathologies by vaccinating properly every single egg or bird at the hatchery. Good hatchery vaccination ensures: an early and strong protection of the birds, improved production results, increased quality of the product at the end of the production chain and consequently maximises economic benefits.

NO GOOD HATCHERY VACCINATION QUALITY WITHOUT GOOD CONTROL

Independently from the vaccination route, delivering the right vaccine dose to 100% of a large number of eggs or day-old chicks is a challenging process. Many parameters can impact the vaccination results: vaccine preparation, operator training, vaccination equipment settings.

Vaccine that is not applied properly at the hatchery can have important impacts later. In addition to the loss of money and



resources at the hatchery, birds missed will not be protected at the farm. This can cause, for instance, an increase of antibiotic treatment consumption during the production cycle. For this reason, it is particularly important to have an objective monitoring and analysis service for the vaccination process. For example, ensuring continuous training of the hatchery vaccination staff, which often has a high turnover rate, can prevent risky situations developing.

The Ceva Hatchery Immunisation Control Keys program of Ceva, named the C.H.I.C.K Program ensures monitoring and control over all those aspects. At the hatchery, the vaccination process is a crucial part of the value chain in poultry production, and its integration into the quality management system is extremely important.

CLOSE FOLLOW-UP: THE KEY OF SUCCESS

A recent study (*G. Franzo et al., 2020) performed in 169 hatcheries across 11 European countries demonstrated that constant follow-up and monitoring of the hatchery vaccination service program (The C.H.I.C.K Program) impacts positively on vaccination quality.

The constant monitoring of key vaccination parameters, such as injection quality or equipment maintenance status, leads to a significant improvement in vaccine administration performance.

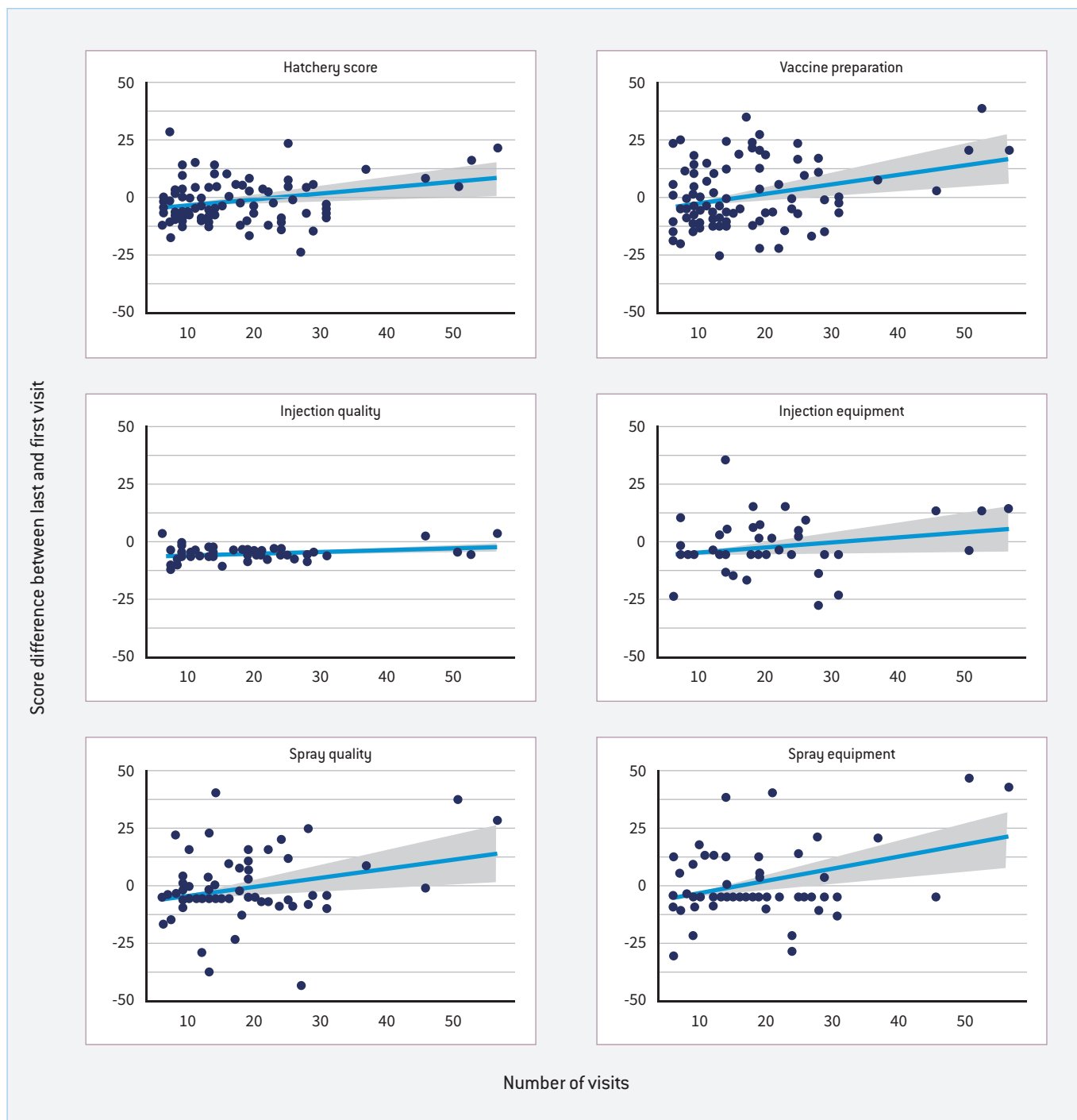


Fig. 1. Scatter plot reporting the variation in global and partial scores between last and first visit plotted against the number of occurred visits. A regression line and relative 95 confidence interval (shaded area) have been superimposed. (G. Franzo et al.,2020)

The regular follow-up of vaccination process KPIs via specific digital tools like the mobile application and web portal for analytics, can bring high value across the whole hatchery and poultry organisation helping:

- To identify vaccination performance deviations more quickly, which can have direct consequences on infectious disease occurrence or animal production performances.
- To optimise indirectly therapeutic and control-related costs.

For any poultry organisation, mastering the vaccination quality control programme data is critical to answer quickly to multiple strategic questions and to take fact-based decisions aimed at seeking the greatest benefit for the company.

*Franzo G, Swart W, Boyer W, et al. No good vaccination quality without good control: the positive impact of a hatchery vaccination service program. *Poultry Science*. 2020 Jun;99(6):2976-2982. DOI: 10.1016/j.psj.2020.03.017. PMID: 32475432; PMCID: PMC7597733.

Every Chick Counts

Choose the right partner!

with **C.H.I.C.K.**
program



The C.H.I.C.K.* Program by Ceva,
aims at having **100% birds well vaccinated**
in the hatchery, **consistently**.

*Ceva Hatchery Immunization Control Keys Program



RWE* STATISTICAL ANALYSIS FOR FACT-BASED DECISIONS

*RWE= Real World Evidence



MATHILDE LECOUPEUR

Corporate Real World Evidence
Manager, Ceva.

KEY POINTS

- Poultry producers generate large amount of data not valued.
- Data analysis allows fact-based decisions.
- Regular statistical analysis becomes a must.

Over the past few years, data science has emerged in all industries, enabling access to new and more relevant information. Strategic information is needed to evolve in today's complex world, full of uncertainty and challenges.

The poultry industry has embraced this digitalisation, collecting data from breeders, through hatcheries and broiler farms, up to slaughterhouses and beyond.

Why collect all this data? To take evidence-based decisions throughout the whole process. Identify room for improvement, optimise the whole process, detect and solve problems.

A LOT OF DATA... NOT ANALYSED

Data is numerous and informative, but making sense of data is difficult. And people often give-up faced with this continuous flow, as they lack both the time and capabilities to benefit from it.

But by matching all the information together it is possible to identify the impact of a bad chick quality, the cost of a disease, or the consequences at slaughterhouse of a bad vaccination, or field challenge.

So many questions are usually pending without any clear answers, although they are critical for the poultry industry. Insights, that can be revealed by the analysis of the data, by Real World Evidence analysis (RWE). However, to do so, all data should be analysed by an expert, a Data Analyst, and must all have at least one key variable in common, on which to connect. This, without mentioning the quality of the data, which should also be reliable.

HATCHERY VACCINATION VS FIELD VACCINATION

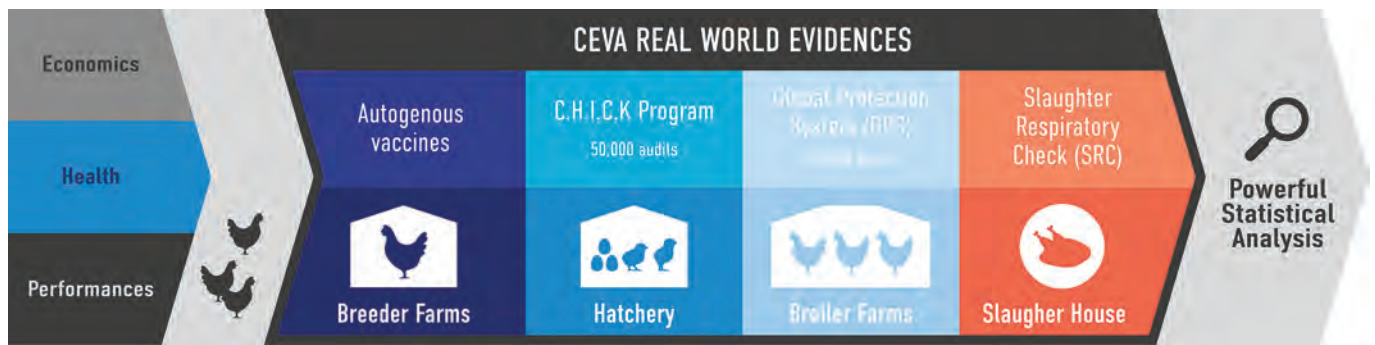
RWE analysis allows us to back up hypotheses with figures. To confirm gut feelings and field experience with statistics. This is how RWE analyses showed that hatchery vaccination offers more than advantages in comparison with field vaccination. That the initial investment is worth it.

Indeed, it not only reduces the stress of the birds and saves time. Above all, it ensures that each and every chick receives the adequate dose of vaccine, that each and every chick is fully and well protected against diseases. All over the world, several RWE analyses focusing on Infectious Bronchitis (IB), Gumboro (IBD) and Newcastle Disease (ND) hatchery vaccination demonstrated that.

FACT-BASED DECISIONS

How it had been demonstrated? By comparing the production parameters (slaughter age, slaughter weight, mortality percentage, feed conversion ratio, etc...) according to different ways of vaccination – at the hatchery vs at farm. Data are objective and reliable, and this kind of RWE analysis has been repeated in different conditions, farm management approaches and under different challenge pressure. Hence its power, its reliability.

The statistical difference ($p < 0.05$) observed between production parameters (eg; 2% of mortality, 2 points of feed conversion rate, 50g of slaughter weight) can at the end be converted into money. Overall, birds vaccinated at the hatchery lead to much better economic performance. Once informed, choices can be made. Choices that will impact the whole chain, from top to bottom. And small changes can lead to huge consequences.



PART OF CEVA DATA SERVICES

Ceva has been collecting large amounts of health data for almost a decade thanks to its hatchery service the C.H.I.C.K. program, launched in 2009, and its veterinarian service called the Global Protection Services (GPS), started in 2017. And Ceva is going a step further with its innovative data service named Real World Evidence, led by expert Poultry Data Analysts, to support its customers to take evidence-based decisions.

In 2021, Ceva launched its Real-World Evidence (RWE) program, aiming at enlarging the capabilities of its veterinarians to work on data, to perform professional analyses for poultry producers using reproducible statistics through an open-source software called Python. Data collected in the field for one customer are internally analysed. Once the statistics are applied, interpretation and solutions are proposed, all 100% customised.

In only a few years, 200+ RWE studies have been done worldwide, demonstrating the expertise of Ceva in this field and the strong enthusiasm and willingness of the poultry industry to learn from its data, to improve production and raise healthy well-protected birds.

Definitions

Real-World Evidence (RWE): recent wording commonly used in human medicine aiming at demonstrating the impacts of a product through the analysis of Real-World Data (RWD).

Real-World Data (RWD): data collected in real life conditions, without control of the environment or some parameters, on chosen subjects.

Western Europe : Hatchery vaccination versus Farm vaccination

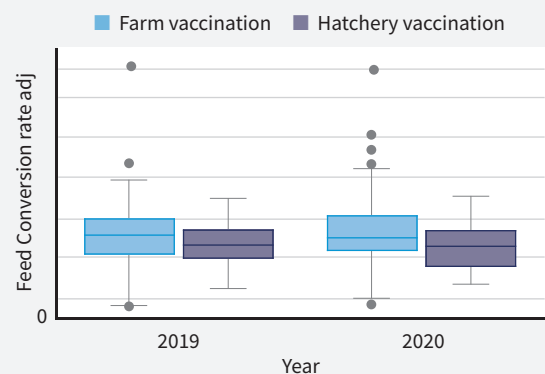
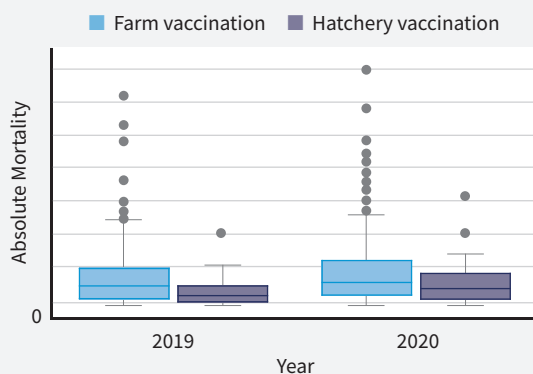
Outcome -1.3% mortality -5 pts feed conversion rate (FCR)

Vaccination prg Hatchery vaccination versus farm vaccination

Average value 50€/000 birds

Number of birds 10.9 Million (366 flocks)

Vaccination group	Hatchery vaccination	Farm vaccination
Number of flocks	85	281
Number of birds (approx.)	2.5M	8.4M
Slaughter age (d)	32	32



SMART TECHNOLOGY FOR A CLEAN HATCH



A decorative graphic at the bottom of the page. It features a series of vertical bars of varying heights on the left, transitioning into a circuit-like pattern with horizontal and diagonal lines. On the right, there are several small circles, some of which contain the letters 'MS', 'MS', and 'MS' respectively.



IMPORTANCE OF IMMUNISATION QUALITY FOLLOW-UP



BERTRAND LE TALLEC

*Vet Services Director,
Ceva.*

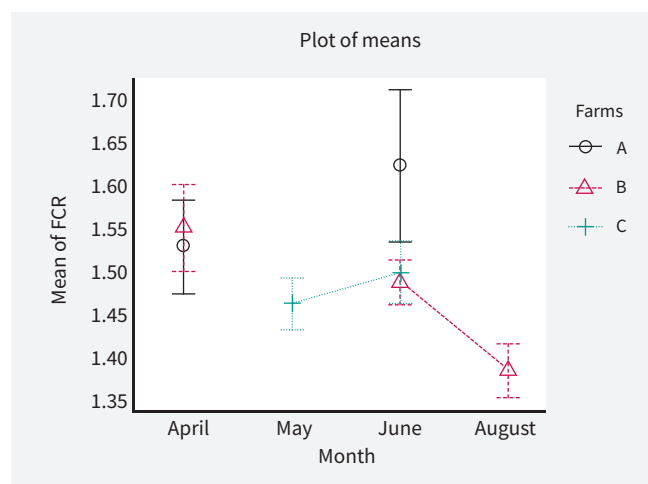
KEY POINTS

- Administration confirmation thanks to PCR.
- Data collection to adjust vaccination program.

IMMUNISATION MONITORING: AN INFINITE DATA SOURCE

From hatchery to slaughter, bird immunity induction involves complex mechanisms requiring accurate control of all steps involved. The evaluation of proper vaccination quality up to assessment of vaccine efficacy, performed by field veterinarian, generates a large amount of valuable information across the production chain.

Fig. 1. Immunisation monitoring.



Bird immunity induction involve complex mechanisms requiring an accurate control of all steps involved, from hatchery to slaughter.

To confirm vaccine administration, vaccine intake is the right parameter to follow. This verification is critical especially for live or vector vaccines.

Clearly, there are several factors related to the correct preservation of the vaccine quality such as maintenance of the cold chain, sanitation standards, correct temperature during administration, etc. In this case despite a good administration (vaccine well sprayed or injected), the vaccine strain will not properly replicate, and the birds will not be protected.

The key diagnostic tool to be used for monitoring vaccine intake is a PCR (usually a real-time PCR). This diagnostic method is extremely sensitive and specific allowing the detection of a targeted viral genome as an indicator of the vaccine virus replication. The following examples help to illustrate the application of this method in the field:

For instance, vaccine take monitoring of Infectious Bronchitis by RT-PCR required multi animals sampling via swabbing the choanal clef at five days post vaccination. Knowing that live attenuated coronavirus strain, commonly sprayed on day-old chicks at the hatchery, is quite fragile, it is critical to perform such monitoring activity on a routine basis.

Indeed, the enveloped virus can be easily inactivated by any trace of chlorine or disinfectants. Consequently, the ability of the vaccine virus strain to reach the receptors in the epithelial cells in the respiratory tract will be significantly diminished or disappear.

Considering that sampling size per flock may vary around 10-20 animals, a large amount of information is quickly available when compiling the different production cycles.

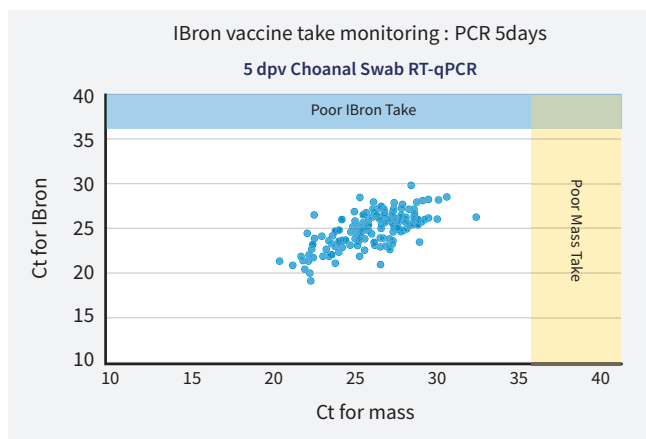


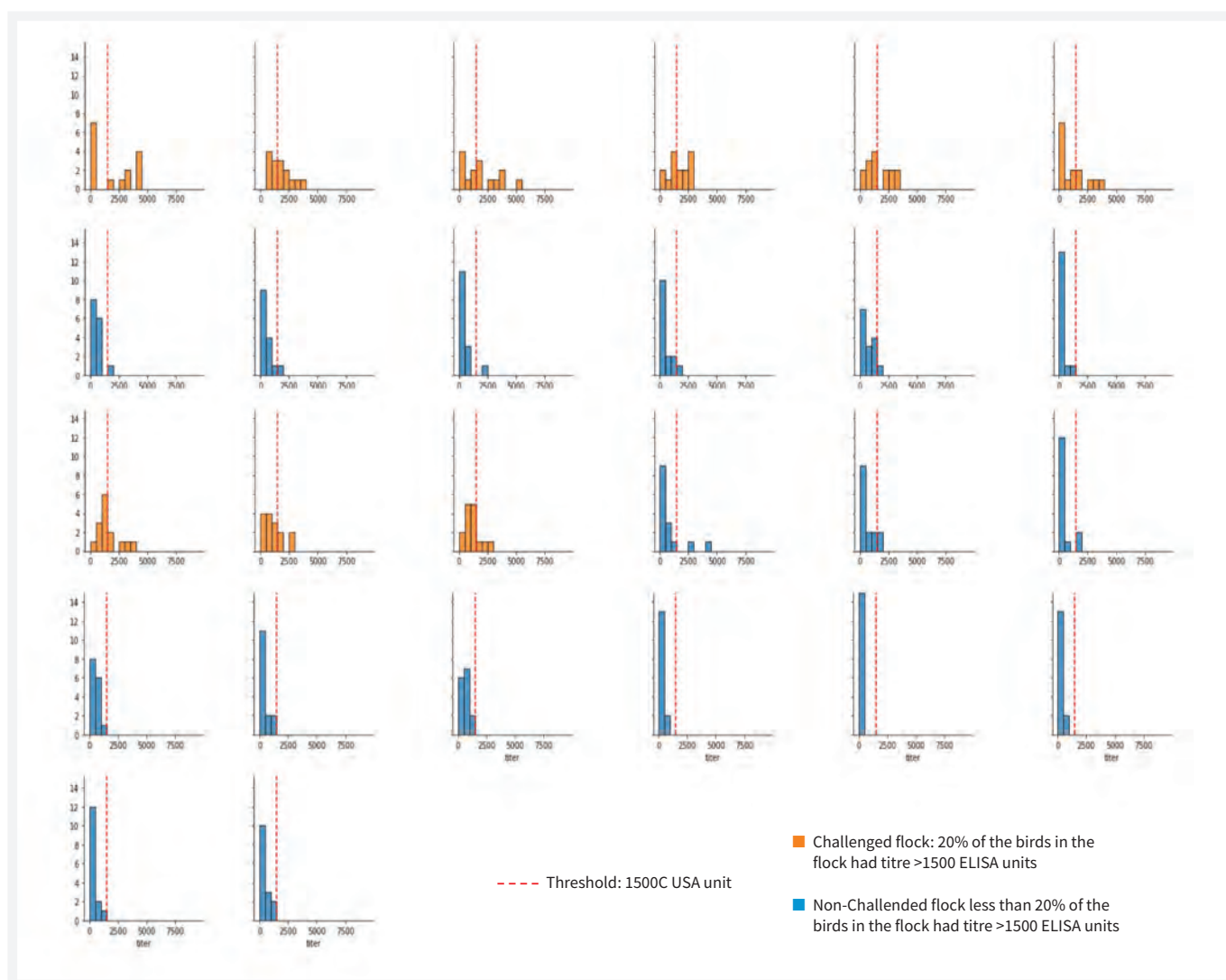
Fig. 2. Monitoring results of infectious bronchitis in 5-day-old broilers using a RT-qPCR on the choanal swabs after day-old chicks were vaccinated at the hatchery with a live attenuated infectious bronchitis vaccine via spray (Cevac IBron – Ga9 strain). The clustering of the data with a high level of detection of the vaccine strain

However, PCR is not the only tool in the field veterinarian's kit helping the follow-up of bird immunisation. Serology can also be one of them. Additionally, during their daily activities, veterinarians must collect production data related to flock performances such as mortality, FCR, body weight, % condemnation rate, first week mortality, etc. Analysing and processing this cumulated data provides valuable information demonstrating the advantages and benefits of selected vaccination programs and bringing additional value across the poultry organisation.

DATA MANAGEMENT: A MUST FOR A FIELD VETERINARIAN

Information generated via the field veterinary expertise must be used for additional value across the organisation. The field of possibilities is large: large trial-scale trials, early zootechnical performance deviation or 'connecting the dots' across the different poultry production units.

Fig. 3. Assessment of the field epidemiological IB pressure in a big integration with 26 flocks.



LARGE SCALE TRIAL

Searching for consistent, significant, and perceptible differences when changes are made in health programs requires a large number of observations under field conditions. Large scale field trials, involving a large number of flocks, are used for this purpose. Preparation of a well-designed and coordinated protocol that is field applicable is required without disturbing the regular production process.

Large-scale field trials generate enough information needed to make evident the differences between the two treatments being evaluated under field conditions. Data from the production parameters obtained from large numbers of broiler flock cycles, following an established protocol, is statistically analysed to detect consistency and trends of the variables evaluated. Differences between vaccination programs under commercial conditions are assessed economically to determine the value of a specific vaccination program over another.

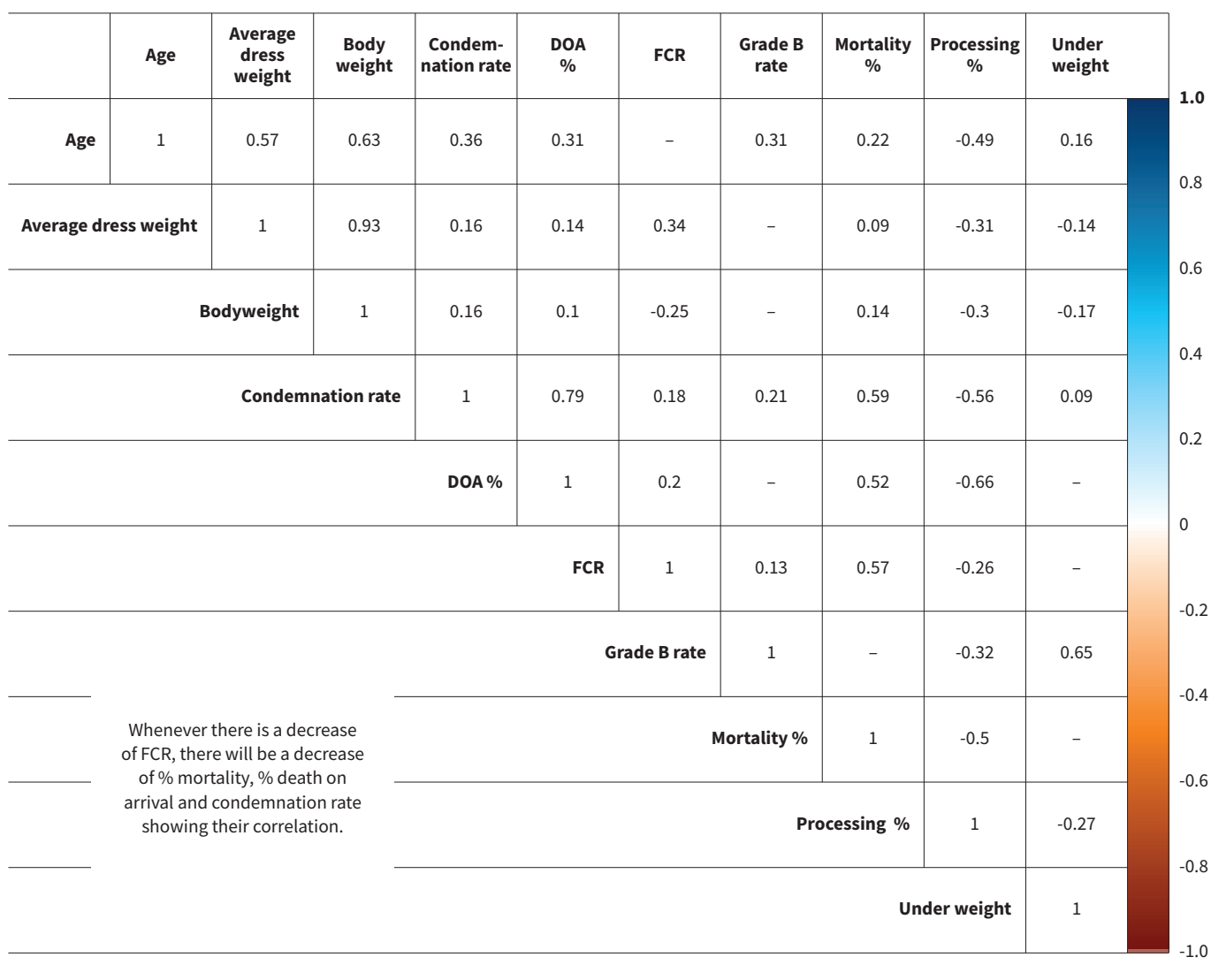
In Fig. 3, a consolidated analysis allows proper assessment of epidemiological IB challenge of large integration. Among the 26 flocks surveyed via thousands of serological ELISA results, nine flocks were clearly challenged (identify in orange). To reach easily this level of information, proper trial protocol combined to specific statistical analysis and data visualisation tools are a must.

CONNECTING THE DOTS

Multiple factors are involved during poultry production which might cause confusion by a simple analysis of the production parameters collected.

Having the monitoring data (immunisation, control of the disease) and cross-referencing them with the production parameters can lead to insights translated into higher efficiency in disease control with the consequent improvement in the production parameters measured and their respective economic advantage.

Fig. 4. Correlation matrix using the 'Kruskal- Wallis H test' showing the correlation between different poultry production parameters.



Smart-Based Decisions



For poultry producers, **Datapulse Platform** allows consolidation of all operational data and easy monitoring of the value chain end-to-end.

Thanks to multisource data analysis.



Data from all
production chains



Historical data and
indicators analysis



Automatic
alarm system

EXTRACTING THE FULL VALUE: CEVA DATAPULSE PLATFORM



THOMAS LEWINER

Group Chief Data Officer,
Ceva.

KEY POINTS

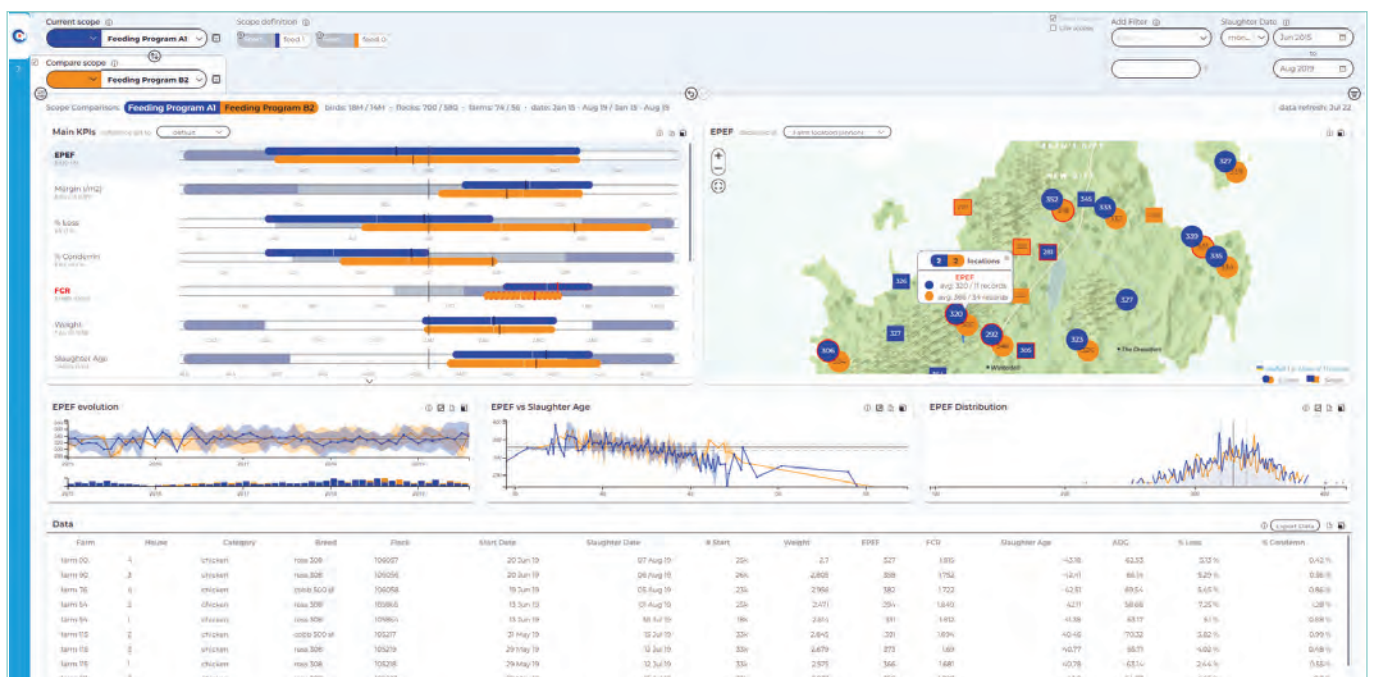
- Multi-source data analysis is mandatory for fact-based decisions.
- Datapulse Platform allows consolidation of poultry production and animal health data.
- User-friendly and interactive visualisations.

Hatchery management relies on several sources of data to be able to comply with tight logistic constraints, while maintaining good performance and quality. Recent developments in data collection, processing, and visualisation bring hatchery management to the next level. This comes at a handy time, since the poultry industry looks for transversal improvements across the full value chain on antibiotic reduction, traceability, and biosecurity. Datapulse Platform is a collection of tools and services to help hatcheries, and poultry producers in general, to handle and analyse multi-source performance and health data. It also supports fact-based decisions with focused information, machine learning prediction and AI-enabled alert systems.

COMPLEXITY OF HATCHERY DATA

While hatchery data is strategic to the poultry value chain, it entails a specific complexity that prevents most information

Fig. 1. Datapulse© platform on breeder data: comparing breeder farms on total number chicks per housed hens at 50 weeks (anonymised).



systems from easily matching breeder and hatchery events with broiler and slaughter performances. Indeed, a single broiler flock is typically composed of eggs going through several setters and incubators, eventually with different origins or storage durations.

On the one hand, this many-to-many mapping is not handled nicely by a spreadsheet nor a tabular database. On the other hand, it is crucial to trace it since the eventual mix of egg lots has a major impact on broiler performances (health status and FCR) and even on hatchability. Properly manipulating hatchery data's complexity allows us to combine multiple sources of information across the whole poultry value chain. Datapulse Platform aims at unlocking this strategic lever.

DATAPULSE PLATFORM

Already strong from its sanitary expertise and hatchery leadership, Ceva developed data services in poultry since 2015 to support hatchery and poultry producers in extracting value from their data. Datapulse Platform connects the different sources and formats of health and performance data, respecting their specificities and granularities, in order to build a transversal view of the operations.

This compiled information supports expertise exchanges through ad-hoc joint statistical studies. It also feeds an AI-enabled data platform that supports common usages for monitoring (see Fig. 1), problem analysis, and troubleshooting (see Fig. 2), a few of them are described below. Altogether, Datapulse Platform helps Ceva customers ground their decisions on data with a transversal view from breeders to slaughter.

END-TO-END TRACEABILITY AND ANALYSIS

Datapulse Platform capability to properly compile data from different steps of the poultry chain already answers traceability requirements for inquiries or certifications.

Furthermore, it facilitates essential questions such as comparing breeder flocks on their end performances at broiler/slaughter stages. It helps searching for problem root causes or improvement levers checking if selected flocks have a common origin or similar trajectory inside the hatchery (see Fig. 2).

MONITOR FLOCK PERFORMANCES

On a daily basis, Datapulse Platform gives a quick overview of breeder or broiler performances. For example, field technicians and veterinarians use the interface to quickly evaluate the status of a farm and its neighbors before a visit. Datapulse Platform offers a synthetic view of a full production complex, allowing managers to focus on individual flocks, eventually comparing them across origins, seasons and according to a personalised reference (see Fig. 1).

VACCINATION QUALITY AND IMMUNISATION QUALITY

Datapulse Platform is integrated with Ceva C.H.I.C.K. program and GPS services. It stores the different reports produced by Ceva such as vaccination quality or serological monitoring. Hatchery managers navigate across historical C.H.I.C.K. program audit scores.

Fig. 2. Datapulse© platform for traceability: main steps from breeder to slaughter on flocks with high condemnation (anonymised).



Datapulse Platform also offers veterinarians a synthetic view with GPS laboratory results and broiler performances, monitoring the quality of immunisation and eventual sub-clinical performance issues.

MEASURE IMPACT OF IMPROVEMENT PROJECTS

Poultry producers are continuously improving, with parallel projects such as reducing antibiotic consumption or renewing hatchery equipment. Datapulse Platform helps maximising the outcome of such projects at two strategic stages: when analysing possible changes, it gives a quantitative baseline of the current practices. Then during the execution monitoring, it gives a quick and complete measure of the improvements achieved.

TOWARDS SMARTER DECISIONS

Datapulse Platform supports several advanced data usages such as AI-powered alerts to accelerate reaction to adverse events. It also entails predictive capabilities such as estimating probability of an early antibiotic treatment on a given broiler flock depending on its origin and the planned destination farm.

Datapulse Platform complements RWE analyzes, helping producers monitor their performances, detect deviations early, trigger deeper analyzes, and monitor the results of their decisions. It benefits from several years of technological investments to offer Ceva customers a unique set of services, helping them manage the complexity of hatchery data in an end-to-end view.

Welcome to the ideal in ovo vaccination process

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CANDLING SYSTEM **LIFE**®

egginject®
IN OVO SYSTEM



Contaminated eggs
and dead embryos
are identified



Only selected live
embryos are injected
and transferred

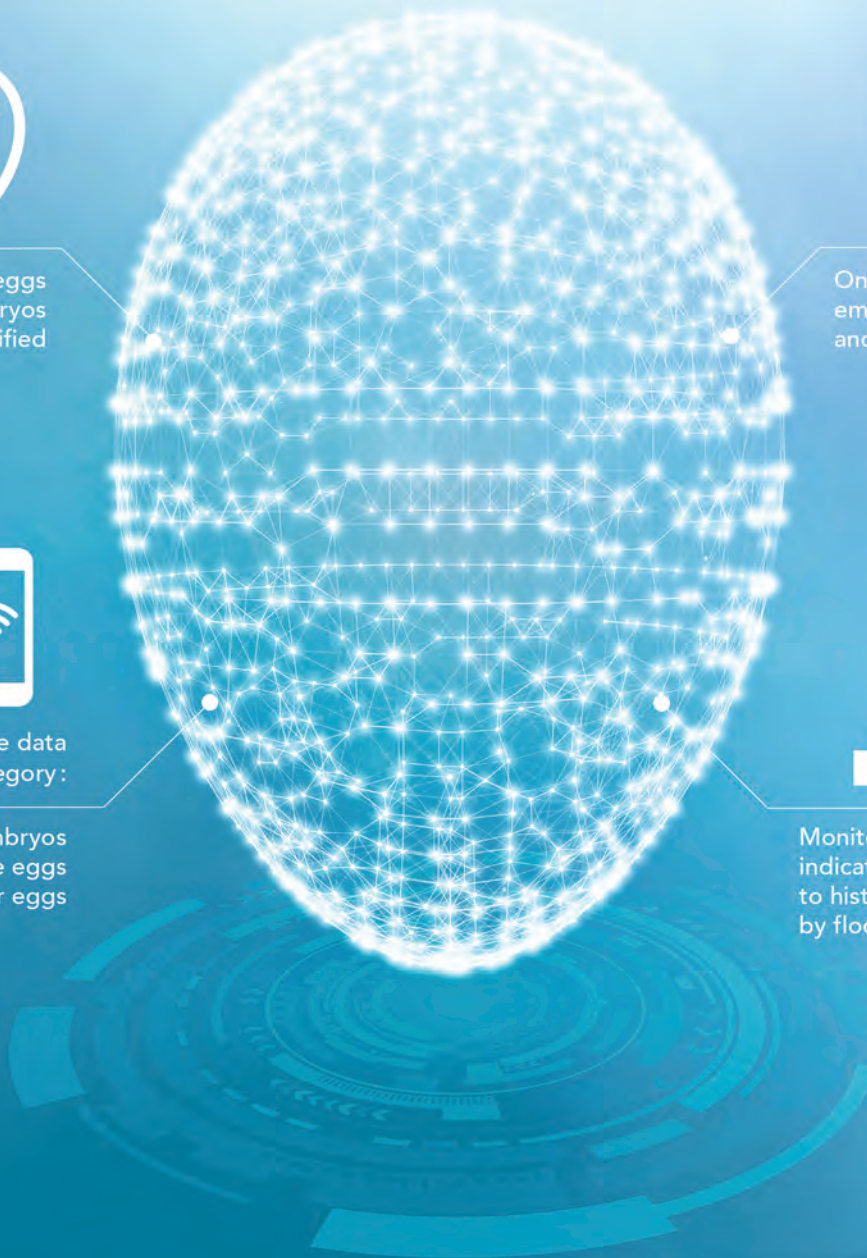


Real time data
Segmentation per category:

% Live embryos
% Non viable eggs
% Clear eggs



Monitoring performance
indicators and access
to historical data flock
by flock



- **LASERLIFE®**. Identifies contaminated eggs and dead embryos.
- **EGGINJECT® SELECTIVE INJECTION**. Only live embryos are injected and transferred while non viable eggs remain untouched.
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