

Innovation in new technologies, especially tools using big data, machine learning and artificial intelligence allow companies in the aquaculture production sector to increase their efficiency, in terms of production methods, resource use, capital expenditure and sustainability. It has been estimated that currently less than 100,000 farmers are using full-suite digital solutions. While not all farmers can afford full-suite coverage, partial digital solutions are proving beneficial for farmers of all sizes.

This [Aquaculture Common Issues Group](#) looked at how improvements in precision farming, farming practices and profitability can be achieved with the help of data technologies, and how increased forecasting and modelling capabilities may improve management decisions. See the presentations from this session:

[Aqualnsights - an overview](#). Willem van der Pijl, Editor-in-Chief Aqua Insights, AquaSpark.

- AquaSpark is working with five companies working on digitalisation (digital aquatech).
- Two worlds – salmon/large scale cage farming, and tropical pond farming of shrimp and fish. The technology for both is very different.
- Salmon/large scale farming – this is drawing the most attention to make it more efficient and reduce waste and impact on the environment. This sector has a good history of automation already and using cameras. They are now looking at making these systems SMART – to automate feeding, to help estimate health and biomass, and lice counting technology. There is lots of ongoing fieldwork. There is big data behind this and work behind the scenes to combine these data streams to allow AI to work to its full potential.
- Tropical pond farming has a different approach. This focuses on optimum water quality. Feeding is still one of them most important elements using acoustic sensors to determine when and how to feed, and how to forecast when to feed. Farmers often lack the investment and the capacity so there is work to support these farmers. There is also help on how to access finance by using the data collected in a better way.
- Other areas of growth are in satellite technology, remote monitoring, early detection of disease and weather events, as well as digital traceability solutions.
- New Aqualnsights publication is out in April and will focus on digitalisation.

Discussion

- **Q. How are digital techniques being taught to farmers? How is this being done? Is it training programmes? Or is it companies actually going in and helping farmers?**
A. It is both. There could be a generational aspect as this is new technology which needs to be embraced. It is a challenge. Companies are really investing in big teams to really support the farmers first-hand. They are offering digital solutions as a service. There are not necessarily demonstration sites/ponds – but this is starting to happen with shrimp ponds more.
- **Q. There is a cost element. How are farmers adapting their business model? Are there concerns about data privacy?**
A. Most of the tech suppliers – they sell the technology as a service so there is no upfront investment for the farmer, they pay a monthly fee. Sometimes farmers are operating below the radar, or they have concerns about sharing their data. Data privacy is high on the agenda for any technology suppliers.
- **Q. What is happening in Africa?**
A. Digitalisation in Africa for the big suppliers is happening but for most of the farmers in Africa they still have other priorities to solve first. There is no silver bullet. This needs to be part of a holistic approach. Digitalisation is part of the answer and becomes bigger as the sector matures.

[Applying breakthrough technological developments to aquaculture.](#) Nathan Pyne-Carter, Ace Aquatec. They work in three areas:

- **Sea lice and predation** – farms have no connected means to track predation levels and efficacy of lice treatments. Their system uses a low-pressure pump, low pressure waterjets, low voltage electric fields, and lice cameras. The aim is to break the cycle of predation using startle reflex (acoustic and electric). Learning can be reversed through conditioned avoidance behaviours
- **Accurate biomass data** - farms have no connected means to assess, manage and judge the efficacy of lighting and feeding regimes on fish growth. Ace biomass uses an underwater camera to provide online data.
- **Humane slaughter** - farms have no connected means to assess, manage and judge the welfare benefits of improved slaughter solutions. They use in-water electric stunning. This can be used for different species.

Discussion

- **Q. You mentioned it took ten years for your camera system to develop. How did you do this? How does it fit into project development?**
A. A lot of time and effort spent developing systems on the farming side. The camera was actually a later development. We switched from red light technology to green light. We were also aware throughout the development of new technologies developing all the time. We adopted a hybrid approach and designed it in a modular way – so we have the option of many combinations.
- **Q. Can you see your technology becoming a pre-requisite for any of the certification schemes, or subject to legislation?**
A. We have had more interaction with that on the electric stunning side and the welfare discussions and considerations. There has been interest from the regulators – but this needs to be a generic approach, not one product. Other approaches could be adopted across the board. Regulators cannot back a single company. It is about utilising the technology to provide a valuable way forward for all. We need to be very open about how the technology works and how we validate it. We have to lead - everyone wants to adopt best practice.
- **Q. This is the technology now – how are you thinking ahead about renewable energy?**
A. We have developed a battery unit for the electric stunners. This is mostly for use in certain situations to offer a hybrid solution. We have to be aware of the best way to finance this and provide this to farmers in an economic way – so not a front-end investment, more a subscription/portal-based model. This has to be the way forward.
- **Q. How has Ace Aquatec benefitted from gaming rules/industry in Scotland?**
A. We have had funding from the group behind the Minecraft franchise. This has helped us to change our model to a subscription-based approach. We are now working on the user experience.

[The digital transformation of oyster farming.](#) James Horton, Chief Technology Officer, SmartOysters (soon to be OceanFarmr).

- This is focussed on non-input farming centred on technology and finance, to optimise feed and return on investment.
- This provided case study examples of two different oyster farms. The SmartOyster app challenge was to either standardise the technology, or to provide a means to catalogue what is actually happening, providing a means to record inventory in real time. This had to be easy and intuitive. It is based on a GPS map-based system which pulls up a whole host of forms and allows forward scheduling. A dashboard provides a complete record of the operation.

- Farmers generally have a big problem accessing finance. We want to be able to provide an asset utilisation report which could help de-risk the finance challenge.
- Sensor integrated operations are mostly driven by the manufacturers, but there can be limited support.

What does farm activity digitalisation enable?



Discussion

- **Q. Have more experienced oyster farmer learnt from this app?**
A. Yes it has freed up time and provided a very good knowledge base. The challenge for all is this is a personal transformation
- **Q. Has this helped with access to finance and insurance?**
A. Yes to both. Mapping assets will help with all of this and allow a different conversation on both counts.
- **Q. Have you considered the educational benefit of all of this?**
A. This has already been built into a training programme and we want to help and experiment in this area.