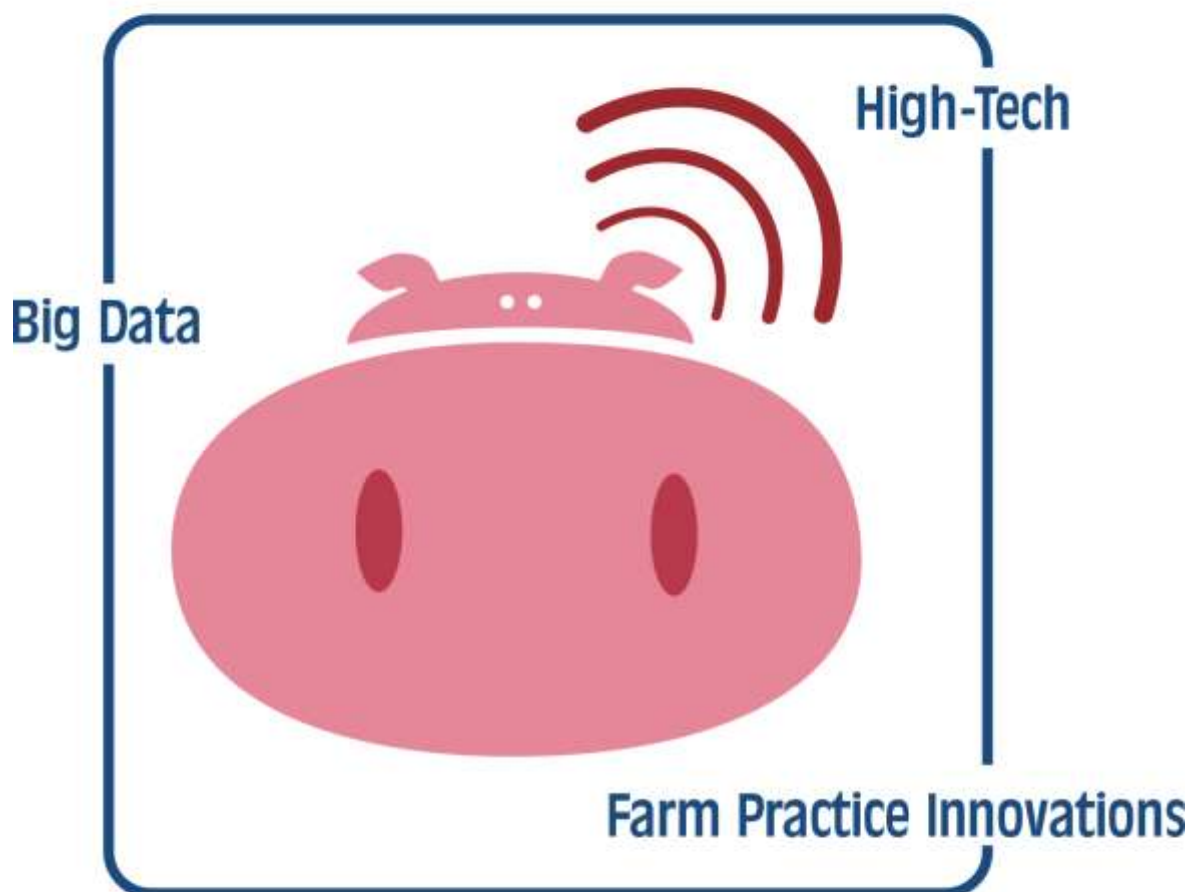


How to implement Precision Livestock Farming?



Animal Task Force & EAAP Special Session
Monday 31 August 2015 14:00h - 18:00h
EAAP Annual meeting 2015 | Warsaw - Poland
Warsaw University of Life Sciences | Building 24, Auditorium 7

Session report

How to implement Precision Livestock Farming?

Animal Task Force & EAAP Special session

EAAP Annual meeting 2015

August 31, 2015 Warsaw, Poland

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ATF-EAAP Special Session 2015

How to implement Precision Livestock Farming?

The ATF and EAAP Special Session “How to implement Precision Livestock Farming?” focused on Precision Livestock Farming (PLF): How to implement Precision Livestock Farming, how research could contribute to on-farm practice and how supply and demand could influence the development and the use of PLF.

PLF is the management of livestock farming by continuous automated real-time monitoring/controlling of production/ reproduction, health and welfare of livestock. Bringing research to practice will become increasingly important in research projects.

This Special Session aimed to contribute to the understanding of the role of the PLF chain - demand and supply actors - and their interaction with scientists in innovation and application of PLF into practice processes.

Programme	
	Building 24, Auditorium 7
14:00	Welcome and introduction <i>by Martin Scholten (President Animal Task Force) and Philippe Chemineau (President 2012-2016 EAAP)</i>
14:10	PLF: Opportunities for herd management <i>by Erwin Koenen (CRV)</i>
14:30	PLF from a food-chain perspective <i>by Ivan Andonovic (Director of Silent Herdsman Ltd)</i>
14:50	Precision Livestock Farming in farmers practice <i>by Fabio Abeni (CRA)</i>
15:10	PLF project: “Bright Farm by Precision Livestock Farming” <i>by Daniel Berckmans (Katholieke University Leuven, project leader)</i>
15:40	Coffee break
16:10	How PLF is appropriated in the H2020 2016/17 workprogramme <i>by Iman Boot (EC Europe)</i>
16:30	Panel discussion <i>moderated by Martin Scholten</i> - With all 5 speakers and audience
17:30	Closing remarks <i>by Philippe Chemineau</i>

Welcome and Introduction

The ATF Chair, Martin Scholten, opened the ATF & EAAP Special session, by introducing the goal of the afternoon, introducing the Animal Task Force, and outlining the programme. The session was introduced by EAAP's president: Philippe Chemineau. About 80 participants were counted. This was the third time ATF and EAAP organised a special session, not about science, but about application of science for the private sector.

The Animal Task Force (ATF) promotes a sustainable and competitive animal production in Europe. We are a partnership of experts from knowledge institutes and industry representative organisations from across Europe. We work closely together with EAAP on setting the European agenda for research and innovation in the animal domain. The year 2015 is focused on Precision Livestock Farming (PLF), which is the basis for this Special Session.

Precision Livestock Farming: Opportunities for herd management

by Erwin Koenen (CRV)

Erwin Koenen is Lead researcher of the Innovation Department at CRV, a cooperative herd improvement organisation established in the Netherlands and providing farmers with genetics services and solutions to improve herd performance. Erwin Koenen: *"How can PLF create value for farmers?"*. The answer is around supporting good herd management, which is a central element of dairy farming, much related to economy, efficiency, health and welfare. He gives two examples of services offered to farmers.

1/ "Ovalert" concept is an integrated fertility solution based on a sensor technology, allowing to provide farmers with information, genetics and fertility services. The system starts from the cow: when the cow is in heat, the farmer gets an alert, allowing the fertility center to provide a mating advice. Then, the farmer can decide to buy semen from the AI organisation or to ask for the AI service, ask for pregnancy check or fertility consultancy.

2/ The "SmartDairyFarming" project (2011-2014) is a pre-competitive large initiative synergising innovations in the production chain, involving a large consortium of farmers, SME companies, research bodies. The main objective is to support farmers with their main herd management processes. The project resulted in very innovative solution, improving sensor technologies and a decision support tool, and building a new concept of PLF infrastructure of data production chain, called "Infobroker". This is a platform for data providers and users, with the aim to include new fair business model to distribute the cost and revenues.

New challenges on the implementation of PLF are technical and commercial: finding new applications for more complex processes, using genomics data for cow-specific feeding, exploitation of big data, closed vs open platform, data ownership and privacy, new business models.

Recommendation Erwin Koenen: PLF creates value to current and future herd management. Its implementation depends on the value of the technical solution and on better collaboration at chain level. Further innovations will benefit from stronger focus on farmers needs and marketing. "We have to get the farmers involved". We may also need new techniques for data mining and exploration of new business models.

PLF from a food-chain perspective

by Ivan Andonovic (Director of Silent Herdsman Ltd)

Ivan Andonovic is Chief Technology Officer and Director of Silent Herdsman Ltd, a high growth company providing animal health services through wireless sensor platforms, based in Glasgow, UK. Its company has developed a collar that sense animal movements and informs about activity, eating period, rumination periods all along the animal life time. It is connected to a cloud-based platform that quantifies performance and efficiency of individual animals and provide key information to stakeholders within the supply chain. It provides both oestrus and health alerts and is used for an increasing range of managements.

Ivan Andonovic recommendation: *“We have saved many animals from dying, identified lameness...Technology is not a problem here. The cloud service offers no limit to the number of services. There are some clusters addressing the whole of the supply chain, but there is a long train before some of these concepts are embraced by the farmers. We did not want the animal to be a Christmas tree with several sensors on it. Standards do not exist in farmers’ environment, but they can be set up. This is a very accurate system for commercial farms.”*

Precision Livestock Farming in farmers’ practice

by Fabio Abeni (CREA)

Fabio Abeni is a specialist in physiology of the dairy cow at the Agricultural Research Council, research institute based in Italy. He has a practical experience as researcher in experimental farm.

He describes a case study on the application of precision livestock farming for dairy cows in a Protected Designation of Origin system (PDO). This case illustrates the way CREA approaches PLF, namely the way they try to face the problem of heat stress in PDO productions. The system relies on an integrated approach allying precision feeding, monitoring of individual rumination and activity, and climate conditions. It is using a TMR on-line analysis system (including a forage analyser, a weighing scale indicator and a feed management software) allowing for diet formulation, based on both climate data (from a meteorological station)and on the activity and rumination of the cow (monitored thanks to a collar).The main conclusion is that heat stress has an important impact on rumination and on production.

Fabio Abeni’s recommendation: *“From a PLF perspective, we can try to differentiate 2 TMR in a day: one for the night-time (higher rumination) and one for the day-time (lower rumination). Further PLF tools would aid us to reduce the negative impact of heat stress on summer milk production, namely for PDO cheeses requiring a higher milk quality for the curd forming process”.*

PLF project: “Bright Farm by Precision Livestock Farming”

by Daniel Berckmans (Catholic University Leuven, project coordinator)

Daniel Berckmans is the project coordinator of a large on-going European project called “Bright Farm by Precision Livestock Farming” (EU-PLF), funded by FP7. The research team that he is leading has been developing PLF since 1991 and is convinced that this technology is a real solution for the challenges in livestock production. The current EU-PLF project is bringing together 20 partners (research institutes, established companies, SMEs, 20 farms...).

He reminds of livestock farming conditions in the past: *“My Grand-father had 11 children, a few pigs and 8 cows! Hence, he had the time to monitor his animals individually by audio-visual scoring. Today, this has become impossible. High increase of consumption of animal products has led to a high number of animals per farm, to less available time per individual animal and more welfare and health problems”*. Today, PLF enables to cope with many challenges such as health, animal welfare, environmental issues, social importance, economic importance... Among them, animal health started to be a major issue, but the consumer seems not prepared to pay for it. *“We are told that animal welfare is the main problem, it is supposed to have value but nobody wants to pay for it. We should not blame the farmer too much and not see him as the (animal’s) enemy. He is the only one to be really involved in animal issues.”* Whereas welfare quality and iceberg indicator are used at slaughter, PLF now allows monitoring during growth. It is able to support an animal based management, enabling continuous automated real-time monitoring of production, reproduction, health and welfare conditions of livestock as well as environmental impact.

D. Berckmans gives many examples and shows videos of available technologies, such as a health monitoring of pigs by on-line sound analysis enabling applications to alert and lead to an individual therapeutic decision in order to reduce the use of antibiotics, a real-time vision-based monitoring early warning system for broiler houses to detect welfare and health problems, a cow lameness monitoring system, a pig aggression monitoring system, a feed intake monitoring for broilers, etc.

Those technologies are able to create value in terms of welfare, health, environmental impact, social recognition, money, etc... not only for farmers, but for the whole value chain. He proposes a new PLF business model, where the cost of PLF investment and operation are shared along the value chain by payment for access to data pool. All the value chain actors (technical solutions providers, breeding companies, veterinarians, consumers, citizens and others...) can be PLF service providers and bring funding, set-up, services, data all along the value chain from feed to farm, from slaughter to retail...

Daniel Berckmans’ conclusions & recommendations:

- **PLF offers fully automated continuous real time detailed monitoring of animals**
- **PLF brings the farmer to the individual animals that need his attention**
- **PLF is a tool that helps farmers and stakeholders**
- **PLF will allow the animals to drive the system, “animals are bright”**
- **A question is raised: who owns / shares information from animal data?**
- **Efficient implementation of PLF needs collaboration between researchers, farmers and stakeholders.**

Finally, he recalls the 7th European Conference on Precision Livestock Farming -ECPLF 2015, at Milan Expo, Italy.

How PLF is appropriated in the H2020 2016/17 work programme?

by Iman Boot (EC Europe, DG AGRI & Rural Development, Research & Innovation Unit)

Iman Boot reminds the role of DG Agri in the planning of research Horizon2020 programming and it's strong input on the rural development policy (namely, through the implementation of the European Innovation Partnership for Agriculture -EIP-Agri).

This special session has shown that PLF can bring a "bright future" in terms of cost reduction, productivity increases, new services offering, marketing opportunities.... However, it has not yet turned into practice. The [EIP-AgriFocus group on Precision Farming](#) has concluded that the three main constraints/levers for up-take are:

1. Independent cost/benefit information: as a farmer, you have to invest a lot and trust something someone is promising you;
2. Data ownership: you give data, but someone can control you;
3. Inter-operationability of different systems...

This implies a risk that only the most interested farmers will take up so. Hopefully, we see standardisation and numerous competing applications coming, that form an enormous promise.

The policy interest considers the perspectives of new revenues for farmers, advisory services, industry, for the improvement of animal health, public health, farm efficiency, mitigation of GHG emissions... What can the European Commission do? The main lever for action is the inter-operationability, where the policy maker can set up standards. The European Commission will fund pilot projects and decision support systems through two pillars:

- The H2020 research policy, which is implemented directly from Brussels (yearly project calls). In October, the new H2020 work programme 2016-2017 will be published, comprising:
 - o A big project on Internet of things 20 million focused on inter-operationability called "Large scale pilots"
 - o A topic on "RoboticsAdvances for Precision Farming"
 - o A topic on the new uses of data: comparing data from individual animals (genetic, gut, feed intake, health...).
- Rural Development policy, using the EIP-Agri operational group instrument. The EC is investing heavily in many projects: *"test something, do whatever you want, not on your own, combine different kind of knowledge (farmers, scientists, vets, multi-actors...) and report to EIP-Agri network."*

Panel discussion

The panel consisted out of five panelists:

1. **Erwin Koenen (E.K.)**, Head of Research at CRV
2. **Ivan Andonovic (I.A.)**, Director of Silent Herdsman Ltd
3. **Fabio Abeni (F.A.)** Responsible of the Laboratory of Biological and Clinical Chemistry at CREA - the Agricultural Research Council
4. **Daniel Berckmans (D.B.)**, Professor at Catholic University Leuven, project leader on the FP7 PLF project
5. **Iman Boot (I.B.)** Directorate General for Agriculture and Rural Development at the European Commission

Martin Scholten (M.S.) moderated the discussion and opened the panel session with the following question:

“What are your questions or statements about including high tech in animal care?”

Public: Do you envisage a period of time in the future where human being won't be in the loop, and that animal will all be automatically controlled?

Public: If you look at different species: the cattle sector has already been so far into taking care about individuals, but how to care for individual animals in large herds?

Public: How to develop social acceptance? How can we communicate about discrepancies, climate smart farming, high tech of animal care, use of antibiotic...? The society comes up with big issues. We see sometimes a lot of manipulation, raised by marginal movements with strong interests against meat.

Public: How will farmers pick-up the technology? How can we bring along citizens who may have the same opinion as your grandfather (D.B.)?

Public: New technologies: how to validate them?

Public: Sensors start being developed: how to combine information together to address high technological need?

Public: Some farmers are very eager to go into new technologies, others not.

Public: PLF needs large investment: what about much larger farms vs. smallholders? Mainstream farmers vs. others?

Public: Considering the response of animal towards feeding... what about response from animal to man...? How to address emotional behavior of animals?

Public: In new business models, payment has to be shared between stakeholders: this is interesting, but which usually works when the services are public goods... here we have mainly private goods.

M.S.: We see a public interest to use technology, while at the same time using technology, especially when it comes to livestock is seen less positively.

M.S.: Who of you consider himself as technology engineers?

Public: Two persons, incl. D.B.

M.S.: Who is dealing with data?

Public: Around 15 persons

M.S.: Who is working with animals?

Public: Most participants

M.S.: Who is working for animal suppliers?

Public: Only 2 people.

D.B.: The human factor is still in the loop, without any doubt, the farmers have to evolve with the technology. When there are several systems, people make the link. We should have more respect for the farmers. The person who has the most process knowledge is the farmer. We have to listen to them. In the EU-PLF project, 20 farmers are involved. Regarding Big data: we are collecting data, and we do real time analysis at body level, only meaningful parameters are sent higher up in the management system. We are not interested in data, we are interested in information.

F.A.: I would have no fear for the robot as it is managed by human. Stress on the cost/benefit ratio, that is to say on the marginal information related to the addition of a new sensor. We should consider improving farmers' welfare. The absence of contact between farmers and animals have to be avoided as they can lead to problems (ex.: heifers management period).

I.B.: Working on social acceptance of new technologies. PLF is a big driver for climate smart farming, as it can lead to incredible efficiency gains, and to get more product from the same input. Efficiency is fantastic but can be presented in a bad light. Consumers may be a bit scared. Why not to present PLF in a high end value and ask for a better price? PLF is intended for big or small farms: technology in arable farming is not so expansive, only bigger farms want to take the risk, but you don't have to own the software yourself.

“What are your statements or opinions about ownership of big data?”

Public: I see a risk that big companies will enter into competition for big data... it is already the case in cattle breeding and it will later come to animal health, selling the treatments animals will need... We ought to build up new farmers' organisation that manage big data, the question of “owing” is more crucial than “sharing” big data.

Public: Different groups have different interest (farmers, breeders...), how to induce them into working together? What is the profitability at the end for the farmer? When farmers show sustainability, citizens will be willing to share.

Public: Data should belong to the farmer: largest data volume is collected by milk recording organisations. We should make a difference between data and information. Farmers should own the data. Information is about bringing a service. We should create new common organisations managing collectively this data, instead of having fierce competition between different firms.

Public: Big data: new industries are coming in with new data, there are more players in the field, farmers have already lost the ownership of data.

Public: Sensors bring data, data combined with knowledge lead to information systems.

Public: Personal data is owned by people. If you declare to use the data, you can organise a system of asking the way and share access to data...

Public: Data in itself has no value. Providing a service to farmers incl. being able to analyse the data. This is where the issues are. UK has created centers of excellence to interpret them, centers of access enabling the creation of new services and added value.

Public: Business model of the PLF: if a lot of people is paying, whose ownership of big data? If you do not pay, ex. Google, we do not pay, we accept the use that is made by others. If the risk is paid by the farmer, why does he pay? Do we want to evolve to a google system, farmers giving data?

Public: Find a Business model and create a win-win situation.

Public: Question of the quality of data.

M.S.: Who is really for open access?

Public: 2 participants

E.K.: We would like to know how this data market will be. Farmers will not be paid for providing the data, in return, they will get a service (that they will still be paying, but cheaper). With PFL, data collection is going to happen everywhere, opening for more players in the field. We will witness new entrants in this market, breeding organisation knows genetics, but business is business: Google knows a lot about data mining and can easily invest in our market. Another example is the competition with a company from the veterinary medicine sector, selling genomic tests including data. More companies will collaborate, I am not sure what the optimum platform will be. If you take more partners on board, they can bring value, if you stay with previous partners only, you will probably have fewer innovations. Everyone wants the big share of the same volume. We want to find a better model: we have 4 partners, how can we make more profit? You need the courage to start this type of discussions. As far as farmers are concerned, what are the benefits to share the data? Most companies need to explain this to farmers in more detail.

I.B.: Data is not information. In data ownership, the most important is the information behind. We need to find out the applications from the ground.

D.B.: Data are useless without knowledge, but knowledge is selected from data: both have value! We have developed 18 products that are marketed, sharing the value with our colleagues researchers. When you start to do that and you are faster than the others, you get the profit. There is a lot of value in data through real time monitoring. Think about making progress, who realises the progress is not that important.

“What are, to your opinion, the white spots in practice? What can we do with technologies? What has to be done for the farmers? Where are the areas where we can benefit from PLF? What are the critical issues of livestock farming that can be tackled by PLF?”

Public: Small ruminants: very few applications vs. a huge demand.

Public: Monitoring and management of animal welfare from indicators coming from the animals to support transparent communication with the society.

Public: Nutrient management for on-farm applications regarding environmental issues.

Public: PLF allows to manage animal variability.

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Public: Improving genomic evaluation in order to use it for individual advice.

Public: Developing multidisciplinary approaches on the animal, including nutrition, disease prevention, having a global view of the animal.

Public: Forage preparation, conservation, grazing management, linking with animals.

Public: Is there a contradiction between PLF and efficiency vs. economies of scale? Precision in breeding is getting less importance, how do we go for precision feeding in large herds?

F.A.: Small ruminants are a white spot that deserve interest. Some objective indicators of animal welfare can support communication with the consumer: we need to build science-based simple messages. We should start assessing some phenotypes with the aid of technologies to describe more dynamic phenotypes. Forage in real time is also key.

D.B.: Small ruminants are a white spot. Ensuring follow-up is also key. When you have information, what do you do with it? For farmers, the technology becomes cheap, so it can be used individually. I see 2 white spots: How can PLF help reduce environmental impact? What about intelligence and emotional response of animals? This is my dream project.

E.K.: Supports 3 white spots from the perspective of the dairy farmer: 1/ Integration of different disciplines: breeding + nutrition, it will benefit the farmer as feed cost is a large proportion of farm costs. How to feed animals without impacting animal health? Taking into account variation between herds and introduction precision feeding.2/ We should come up with more concrete actions, not only on producing alerts, but also indicate what action farmers can take and how this affects farmers' final profit (i.e.: alert for lameness...). 3/ Environmental issues.

M.S.: Variation is a friend for the future. We need variation to feed the world.

Closing remarks

by Philippe Chemineau

Our discussion today is a good illustration of the fact that engineers, farmers, scientists need to work together... and also ask the farmers (our grandfather). Our symposium is a starting point for installing this triplets engineer, scientist, farmers. We've had exciting presentations and discussions raising many questions: How to increase the precision of data collected (i.e. methane precision of phenotype)? How to increase the competitiveness of livestock systems, the traceability of our systems from the farm to the product? How to improve welfare conditions? At the end, animals may be able to drive the system by themselves, animals would be owners of their own data that will cause big problems of interoperability! Do we need info brokers to improve modeling the use big data, huge databases?

Martin Scholten concludes: the Animal Task Force's annual theme of this year is PLF. We are discussing, trying not to duplicate the project of Daniel and many others. **You might participate:**

- Animal Task Force is drafting a position paper (we were successful with our White paper, the next white paper will be about EU countries, and the third one on PLF).
- We are providing an internal blog to host the discussion. You are invited to provide your email address to get access to the reserved area of ATF website.
- Our next seminar, on November 17th will gather parliament members, representatives of the European Commission, European branch organisations... you are all invited to come.

- Then, we should use Belfast EAAP meeting to make a next step... celebrating the success of the EU-PLF on-going project...