LivestockSense:

A multinational project to remove barriers for PLF technology adoption within the pig and poultry industries

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Presenter: Assoc. Prof. Sebastian Opaliński

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2019 cofunded Call, End-term Project Seminar, 30th January, 2024

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grand agreement no 862665 ICT-AGRI-FOOD.

Involved 7 countries and several partners

ERA-NET COFUND ICT AGRI FOOD

Commercial/semi-commercial partners:

AgHiTech

AKI Institute of Agricultural Economics

MIGAL Galilee Research Institute LTD.

SBA Research

Innvite

University partners:

SLU SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES

WROCŁAW UNIVERSITY OF ENVIRONMENTAL AND LIFE SCIENCES

Eesti Maaülikool EMU Estonian University of Life Sciences

AARHUS UNIVERSITY

The following national funding agencies contributed to the project:

רשות החדשנות Israel Innovation Authority

Miljø- og Fødevareministeriet gudp

NCBR National Centre for Research and Development

National Research, Development and Innovation Office Hungary — PROJECT FINANCED FROM THE NRDI FUND

Bundesministerium Landwirtschaft, Regionen und Tourismus

Republic of Estonia Ministry of Rural Affairs

FORMAS

LivestockSense

Enhancing environmental sustainability of livestock farms by removing barriers for adopting ICT technologies.

ERA-NET COFUND ICT AGRI FOOD

The project was characterised by close and fruitful cooperation with scientists, policymakers, technology providers, ICT developers, farmers

Project duration: 1 April 2021 – 31 May 2023

Overall budget: 1.64 million Euros

LivestockSense site: https://livestocksense.eu

This presentation is based on the result of the LivestockSense project that received funding from the European Union's Horizon 2020 research and innovation programme, under grant agreement No. 861665 ERA-NET ICT-Agri-Food. The authors acknowledge the contribution of AgHiTech Kft (HU), Institute of Agricultural Economics (HU), MIGAL-Galilei Research Institute Ltd. (IL), SBA Research (AT), Innvite ApS. (DK), Swedish University of Agricultural Sciences (SE), Wroclaw University of Environmental and Life Sciences (PL), Estonia University of Life Sciences (EE), Aarhus University (DK) and the co-funding of the following organizations: NRDI Funds (HU), Israel Innovation Authority (IL), Bundesministerium, LRT Fund (AT), GUDP (DK), Ministry of Rural Affairs (EE), The National Centre for Research and Development (PL) and FORMAS (SE).

Objectives

The “LivestockSense” project was developed, funded by the European Union and implemented
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The “LivestockSense” project was developed, funded by the European Union and implemented in seven (7) different countries with the participation of 9 different academic and commercial partners to:

- **Understand and eliminate the various barriers preventing the wider adoption of AgTech technologies and thus**

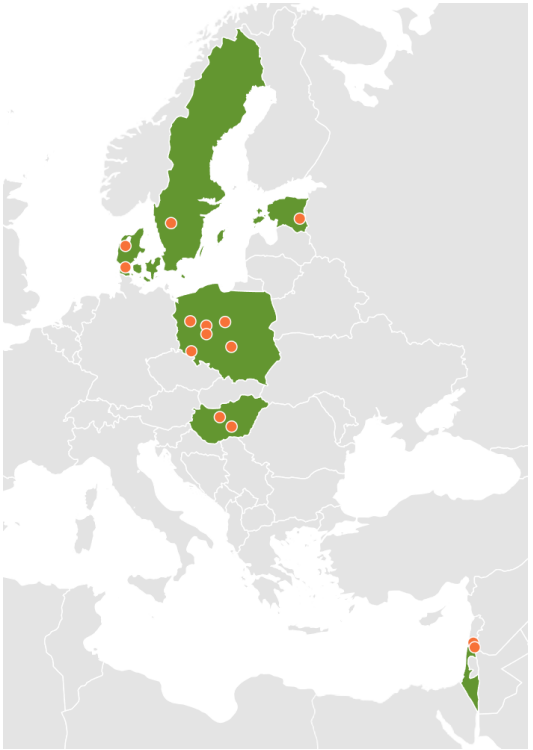
- **Increase the adoption rate of PLF/smart technologies in Europe and internationally**

Research approach

Five interlinked subprojects implemented:

1. Scientific review was undertaken re: SMART technology use in the EU

2. Database modified and on-farm data collection undertaken (via the deployment of 20+ PLF tools on 15 farms in 6 countries)



Research approach

Five interlinked subprojects implemented:

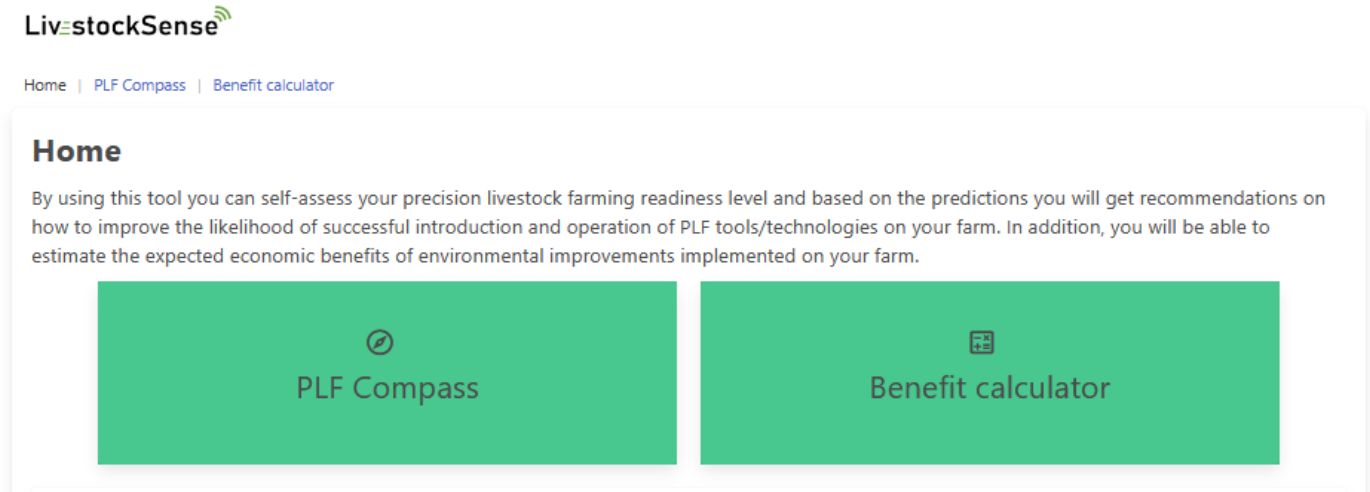
3. a. Quantitative surveys implemented via standardized on-line questionnaires completed by 121 pig and 145 poultry farmers

b. Qualitative interviews and focus group discussions (FGDs) conducted with 83 invited participants

Research approach

Five interlinked subprojects implemented:

4. Machine learning techniques applied to identify clusters of technology users
5. PLF Compass applications developed to classify users, generate advice and calculate potential benefits



Major results: Review and on farm data collection

1. I. Kopler, U. Marchaim, I. Tikasz, S. Opaliński, E. Kokin, K. Mallinger, T. Neubauer, S. Gunnarsson, C. Soerensen, C. Phillips, T. Banhazi (2023) Farmers' Perspectives of the Benefits and Risks in Precision Livestock Farming in the EU Pig and Poultry Sectors Animals 13, 2868. https://doi.org/10.3390/ani13182868

2. Banhazi T.M. Dunn, M. and Banhazi, A. (2022) Weight-DetectTM: On-farm evaluation of the precision of image analysis based weight prediction system (Practical Precision Livestock Farming, Wageningen Academic Publishers) Editors: T. Banhazi, F. Maroto-Molina and V. Halas pp: 29-39

3. Banhazi T.M. Dunn, M. and Banhazi, A. (2022) Weight and environmental monitoring: Growth curve differences of fast and slow growing pigs under commercial farm conditions, Wageningen Academic Publishers) Editors: T. Banhazi, F. Maroto-Molina and V. Halas pp: 41-51

4. Banhazi T.M., B. Ji, D. Rutley, C. Phillips. (2022) Modelling the effects of environmental stress on weight gain in pigs (Practical Precision Livestock Farming, Wageningen Academic Publishers) Editors: T. Banhazi, F. Maroto-Molina and V. Halas pp: 193-210

5. J.L. Black and Banhazi T.M. (2022) Integrated biological-economic simulation models to aid real-time application of Precision Livestock Farming to the pig industry (Practical Precision Livestock Farming, Wageningen Academic Publishers) Editors: T. Banhazi, F. Maroto-Molina and V. Halas pp: 369-380

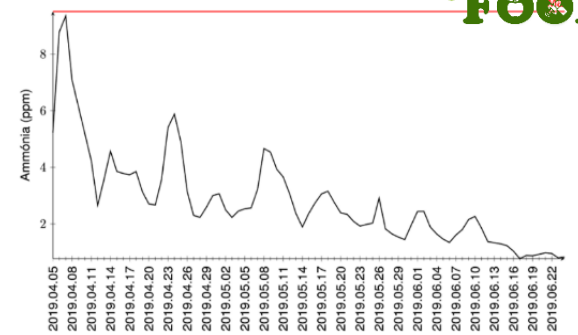
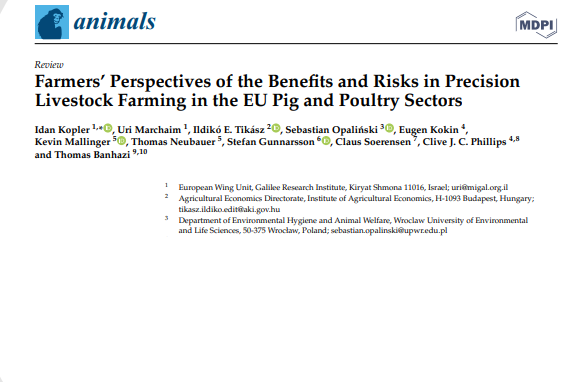


Table 1: Summary (last week)

Days	Starting weight	Finishing weight	Weight gain	Growth rate
7	84.7 kg	88.5 kg	3.7 kg	618.3 g

Table 2: Summary (weight gain period)

Days	Starting weight	Finishing weight	Weight gain	Growth rate
58	39.8 kg	88.6 kg	48.8 kg	855.8 g



animals

MDPI

Review

Farmers' Perspectives of the Benefits and Risks in Precision Livestock Farming in the EU Pig and Poultry Sectors

Idan Kopler [1,*], Uri Marchaim [1], Ildikó E. Tikász [2], Sebastian Opaliński [3], Eugen Kokin [4], Kevin Mallinger [5], Thomas Neubauer [5], Stefan Gunnarsson [6], Claus Soerensen [7], Clive J. C. Phillips [4,8] and Thomas Banhazi [9,10]

[1] European Wing Unit, Galilee Research Institute, Kiryat Shmona 11016, Israel; uri@migal.org.il
[2] Agricultural Economics Directorate, Institute of Agricultural Economics, H-1093 Budapest, Hungary; tikasz.ildiko.edit@aki.gov.hu
[3] Department of Environmental Hygiene and Animal Welfare, Wroclaw University of Environmental and Life Sciences, 50-375 Wroclaw, Poland; sebastian.opalinski@upwr.edu.pl

Major results: AI model, qualitative and quantitative results

Users	Non users
Highly, moderately automated farms	Medium or low automated farms
The average age of their buildings and production technology is less than 20 years, or even 10 years. Buildings and equipment older than 20 years are almost uncommon.	The age of their buildings and housing technology tends to be between 10 and 20 years old, or mixed, with buildings and equipment older than 20 years also occurring.
Internet connection opportunity by 96% of the farms.	Internet connection opportunity by 86% of the farms.
Network within the livestock buildings which is able to connect to the internet by 76% of the farms	Network within the livestock buildings which is able to connect to the internet by only 44% of the farms

Denomination	Users	Non-users
Smart technologies provide information in a real-time manner	89%	67%
Smart technologies enable to increase the effectiveness of production	88%	56%
Smart technologies provide reliable information.	81%	56%
Smart technologies prove/improve transparency within production.	81%	50%
It is easy to access smart technologies on the market.	69%	19%
Smart technologies operate in a reliable manner.	61%	22%
Smart technologies are easy to operate.	59%	31%
It is easy to get information on smart technologies and distributors.	56%	25%
Smart technologies can be maintained at a reasonable cost.	47%	8%
It is easy to get technical assistance to smart technologies.	47%	8%
Proper education is available for using smart technologies.	44%	11%
Smart technologies can be purchased at an affordable price.	31%	3%

Tikász, I. E., Bálint, C., Király, G., Banhazi, T., Mallinger, K., Gunnarsson, S., Kokin, E., Marchim, U., Opalinski, S. & Sorensen, C. A. G. (2023a). Conditions of applying advanced information technologies in livestock farming. In XL CIOSTA & CIGR Section V International Conference, Vol. 1, in-print (Ed V. Fitas da Cruz). Évora, Portugal: Évora University.

Tikász, I. E., Bálint, C., Király, G., Banhazi, T., Mallinger, K., Gunnarsson, S., Kokin, E., Marchim, U., Opalinski, S. & Sorensen, C. A. G. (2023b). A survey of pig and poultry farmers' readiness and attitudes towards smart technologies. In XL CIOSTA & CIGR Section V International Conference Vol. 1, in-print (Ed V. Fitas da Cruz). Évora, Portugal: Évora University

Major results: AI model, qualitative and quantitative results

Principal Component Analysis (PCA)

Machine learning techniques

were applied to identify 3 clusters

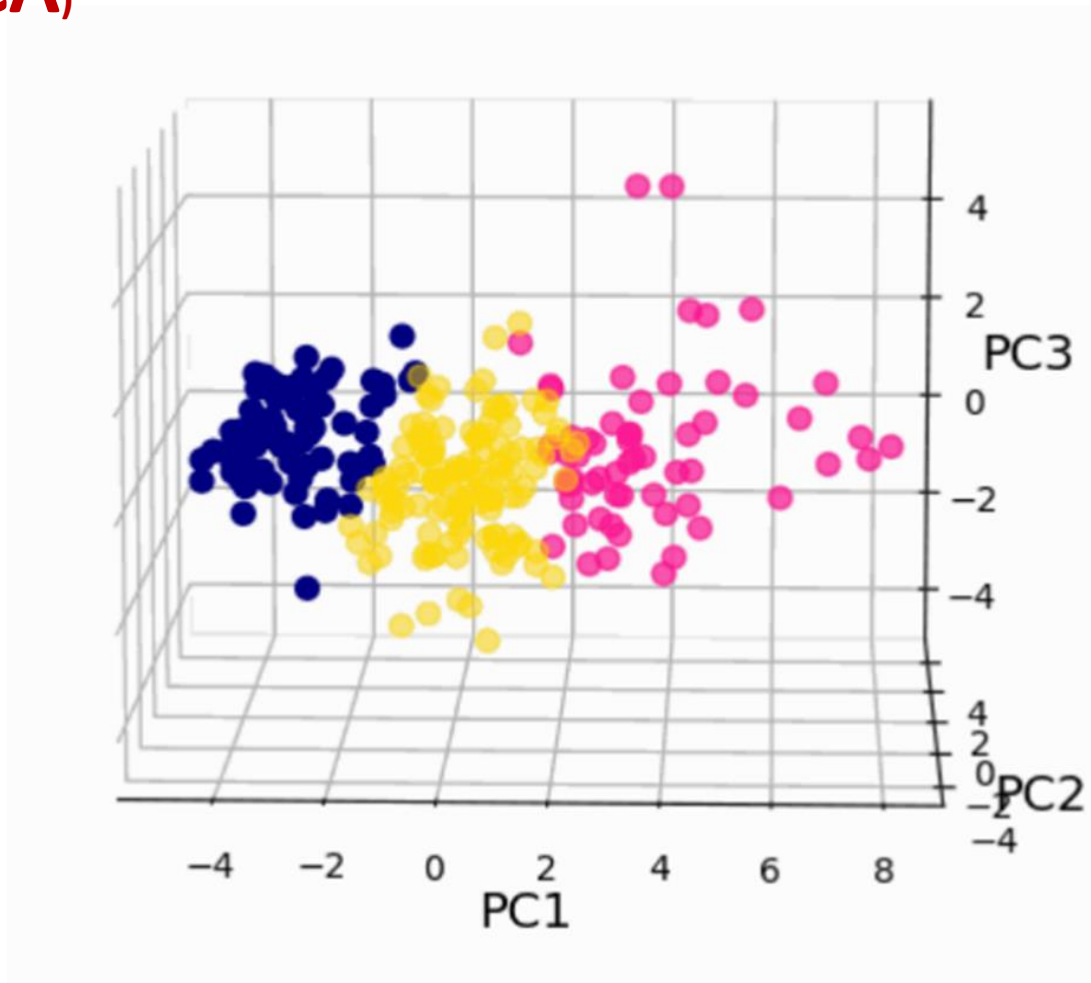
(blue, yellow and red colour)

of technology users:

„Not Ready”

„Partially Ready”

„Ready”



K. Mallinger, L. Corpaci, T. Neubauer, I. E. Tikasz, and T. Banhazi (2023) Unsupervised and supervised machine learning approach to assess user readiness levels for precision livestock farming technology adoption in the pig and poultry industries Computers and Electronic in Agriculture (213: 108239) https://doi.org/10.1016/j.compag.2023.108239

Major results – The “LivestockSense PLF Compass” application

https://plfag.info/index

Precision livestock farming readiness

Based on your answers, you are one of those users who know the real potential of PLF technologies and are fully ready to use PLF technologies or are already widely using them.

Buildings and equipment in your farm are likely to be suitable to accommodate smart technologies.

Your farm and livestock buildings are rather well-equipped with internet access, which is a very important condition for the deployment of smart technologies.

You have confidence in smart technologies and believe that they can be a great help in allocating work at your farm as well as enable to increase the effectivenes of production. You consider ICTs as an important decision support tool. Therefore, your concerns about data protection, data management of these new technologies are moderate. You can afford the cost of purchasing and maintaining smart devices and find ways to overcome the difficulties of operating them and connect them with your other tools. You have no problems acquiring and keeping up to date with knowledge about smart devices, and you know what sources of information to rely on. You also have sufficient experience in the maintanance of smart devices.

As a potential advanced PLF user, the main challenge for you is to take full advantage of economic and environmental potential of PLF technologies, keep up your achievements and improve your operation.

In order to boost your confidence in smart technologies, based on the research conducted within the framework of the LivestockSense project, we give the following recommendations to you, in order to enable you to benefit from using PLF technologies:

Readiness of farm infrastructure

Different smart technologies require facilities of different sizes, structures and equipment.

- The arrangement and level of automation of older buildings may be less suitable for smart technologies. Examine your infrastructure/technology to see if it is compatible with the new technology and if upgrades are needed to maximise the use of the device.
- Internet access on the livestock farm does not in itself guarantee the presence of an Internet-enabled network in the livestock buildings. If necessary, ensure that livestock buildings are connected to the Internet.

Information gathering

Workforce efficiency

Education and traning

Reliability

Connectivity

Data management and security

Investment need

Operation

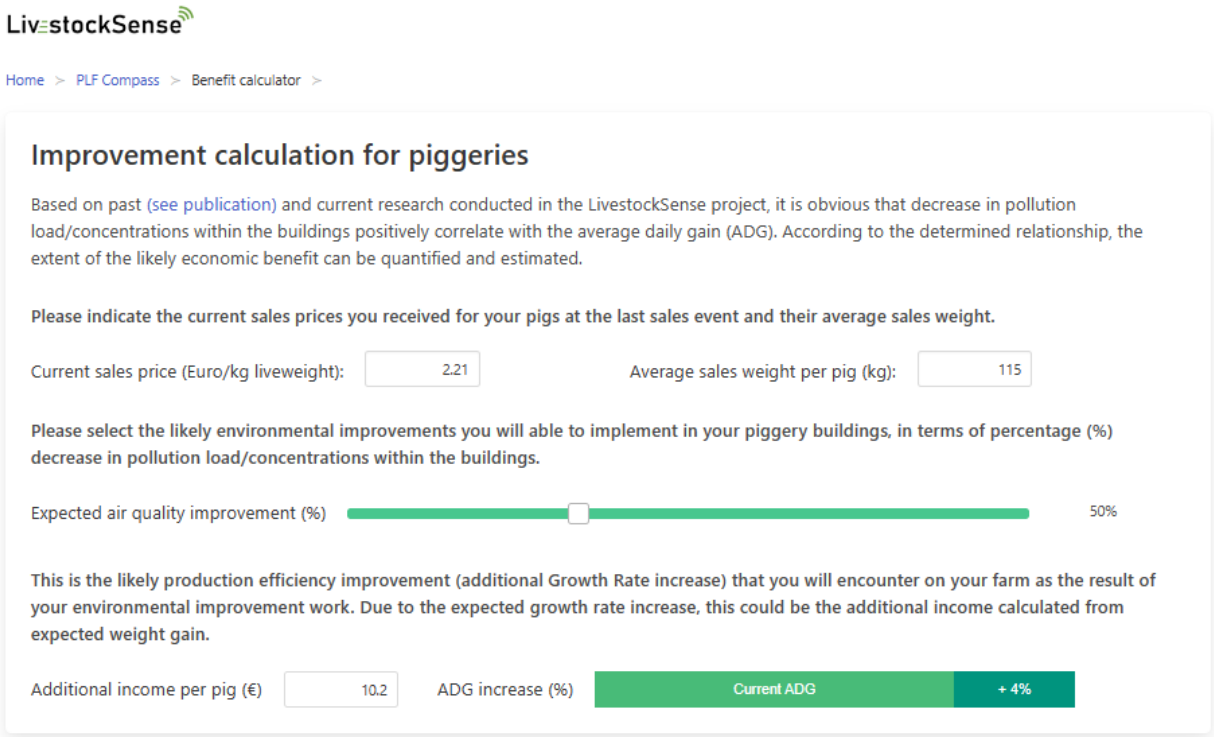
Maintenance and support services

After answering only 17 questions, the user are classified into 3 categories (advanced, novice, and interested) and specific recommendations are given to assist producers with technology implementation

Banhazi, T. M., A. Banhazi, I. E. Tikasz, Sz. Palotay, K. Mallinger, T. Neubauer, L. Corpaci, U. Marchaim, I. Kopler, S. Opalinski, K. Olejnik, E. Kokin, S. Gunnarsson, T. Bjerre and C. Soerensen (2023)
LivestockSense: A multinational project to remove barriers for PLF technology adoption within the pig and poultry industries.
In the proceedings of International Symposium on Animal Environment and Welfare (ISAEW 2023) (Ed: B. Li and Q. Zhang), pp: In-print, October 23–25, 2023 in Chongqing, China, IRCAEW

Major results – The “LivestockSense PLF Compass” application

https://plfag.info/index



Producers can also indicate the likely environmental improvement implemented (percentage reduction in airborne pollutants). The software tool will calculate the likely extra sales prices received for their animals as the results of extra production efficiency gained

Banhazi, T. M., A. Banhazi, I. E. Tikasz, Sz. Palotay, K. Mallinger, T. Neubauer, L. Corpaci, U. Marchaim, I. Kopler, S. Opalinski, K. Olejnik, E. Kokin, S. Gunnarsson, T. Bjerre and C. Soerensen (2023)
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Cooperation with stakeholders, industry partners, public and private sector

List of stakeholders that were involved in the study:

- **Isreal:** The “Lulei-of HaGalil” broilers’ integration, Galilee Agricultural Company, Znobar Company, Kibbutz Kfar-Giladi and Kibbutz Kfar-Hanasi

- **Estonia:** Estonian Pig Breeding Association

- **Poland:**
- Polnet Sp. z o.o. i Wspólnicy Spółka Komandytowa
- JOTAFAN Andrzej Zagórski
- BIG DUTCHMANN Polska Sp. z o.o.
- POLSUS
- PELLON Sp. z o.o.
- Vencomatic Polska

Cooperation with stakeholders, industry partners, public and private sector

List of stakeholders that were involved in the study:

- **Denmark:** BIG DUTCHMANN Denmark, SKOV Company, Danish Pig Producers, Danish Poultry Producers, Danish Eggs Producers, SEGES

- **Sweden:** Swedish Pig Producers Association (Sveriges Grisföretagare), Swedish Egg producers (Svenska Ägg), Swedish Poultry meet association (Svensk Fågel), National veterinary institute (SVA), Animal Welfare Sweden (Djurskyddet Sverige), Swedish Reasearch Institute (RISE),

- **Hungary:** Hungarian Ministry of Agriculture Department for Agricultural Modernisation; The Hungarian Chamber of Agriculture; Hungarian Association of Pig Breeders and Pig Farmers, Hungarian Poultry Product Board, Hungarian University of Agriculture and Life Sciences (MATE), ELTE Eötvös Loránd University Faculty of Informatics; EVI Precíziós Termelés Kft., Fülöpkert Kft., Aliter-P Kft., Barser Kft., Bentley Magyarország Kft., Agrofeed Kft., Senit Kft., Dalmand Zrt., Gyentak Kft., Poultry-Tech Kft., Hat-Agro Baromfitechnológia Kft.,

Opportunities and next steps for innovation

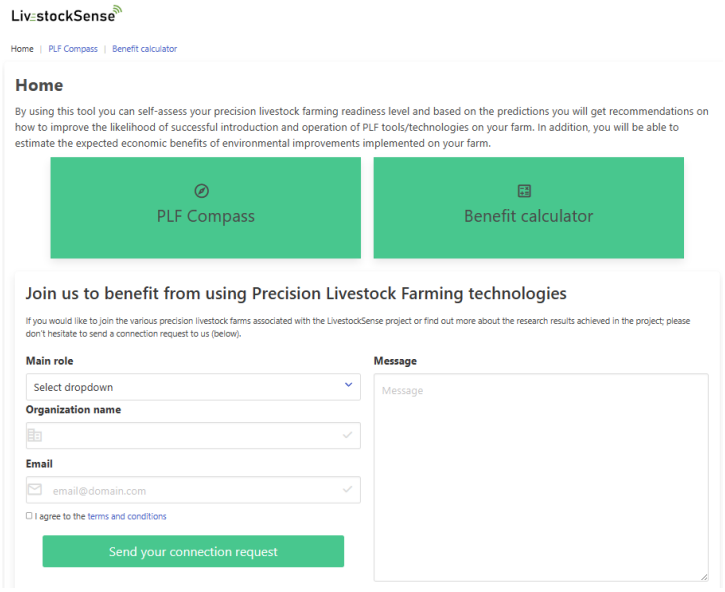
- **A new ERA-NET project (ET4D) was initiated and subsequently funded in collaboration with most of the LivestockSense (LS) project partners.**
- **We look forward to using and extending the results of the LS project during the life of this new ERA-NET project. We also appreciate the ongoing support of the ERA-NET office and the opportunity created for us to develop the LS project results further.**

- **An additional Horizon Europe projects are planned, incl. collaboration again with many of the LS partners and additional commercial companies/collaborators (SmartDairyStartups)**

Opportunities and next steps for innovation

- **Further publications are planned by AKI and AgHiTech Kft in collaboration with all LS project partners.**

- **PLF Compass application is currently hosted by AgHiTech Kft. and available to be used by the general public. It will be used/promoted commercially in the future, thus ensuring that the main outcomes of the LivestockSense project will prevail.**



Summary/conclusion & lessons learned

Wider adoption of SMART agricultural systems is desirable, but various factors are limiting adoption rate, such as:

- **Unreliable internet connectivity on farms (often this is a government issue, lack of will to force private internet providers to adequately cover country areas that are often unprofitable)**

Summary/conclusion & lessons learned

Wider adoption of SMART agricultural systems is desirable, but various factors are limiting adoption rate, such as:

- **Lack of available capital/investment in farming (and thus low level of automatization on the farms, old livestock buildings/associated production technologies, smart technologies seen as expensive)**

- **Lack of available capital/investment for technology developers (and thus, underdeveloped technologies with complicated operations deployed, slow maintenance services and inability of tech providers to generate evidence about the expected benefits)**

Summary/conclusion & lessons learned

Wider adoption of SMART agricultural systems is desirable, but various factors are limiting adoption rate, such as:

- **Uncertain ownership/access the collected data (lack of standardization, legal framework)**

- **Lack of training for AgTech users and/or unavailability of qualified personnel to interpret the information captured**

LET'S KEEP IN TOUCH!

Please feel always free to reach out to us.

LINKEDIN

LivestockSense on LinkedIn: #ictsolutions #sustainableagriculture #livestockfarming #smarttechnologies…

WEBSITE

https://livestocksense.eu

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Thank you for your attention!