Economic feasibility of using sensing technologies for welfare monitoring in the pig value chain

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ClearFarm

A Systematic Review on Validated Precision Livestock Farming Technologies for Pig Production and Its Potential to Assess Animal Welfare

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Very little information on sensor accuracy

Literature review

Search 1 “economic”+ “disease” + “pig” → 2359 hits

Search 2 “economic” + “precision”/”sensor” + “pig” → 56 hits

Only 3 papers on economic analyses concerning application of technologies

Very little information on sensors profitability

The aim of this study was to assess the economic feasibility of using sensing technologies for welfare monitoring in the pig value chain

Sensors monitoring:

1) Tail biting
2) Respiratory infections
3) Pen fouling

Material and methods

Bio-economic modelling

Growth
Mortality
Welfare issue (tail biting, pen fouling, respiratory infections)
Sensor effect

Revenues from selling
Feeding costs
Medication costs
Cleaning costs
Piglet costs
Labour

Model parameters were set to represent average costs and benefits from countries participating in the ClearFarm project (Netherlands, Spain and Denmark).
Sensor installation costs were considered fixed.

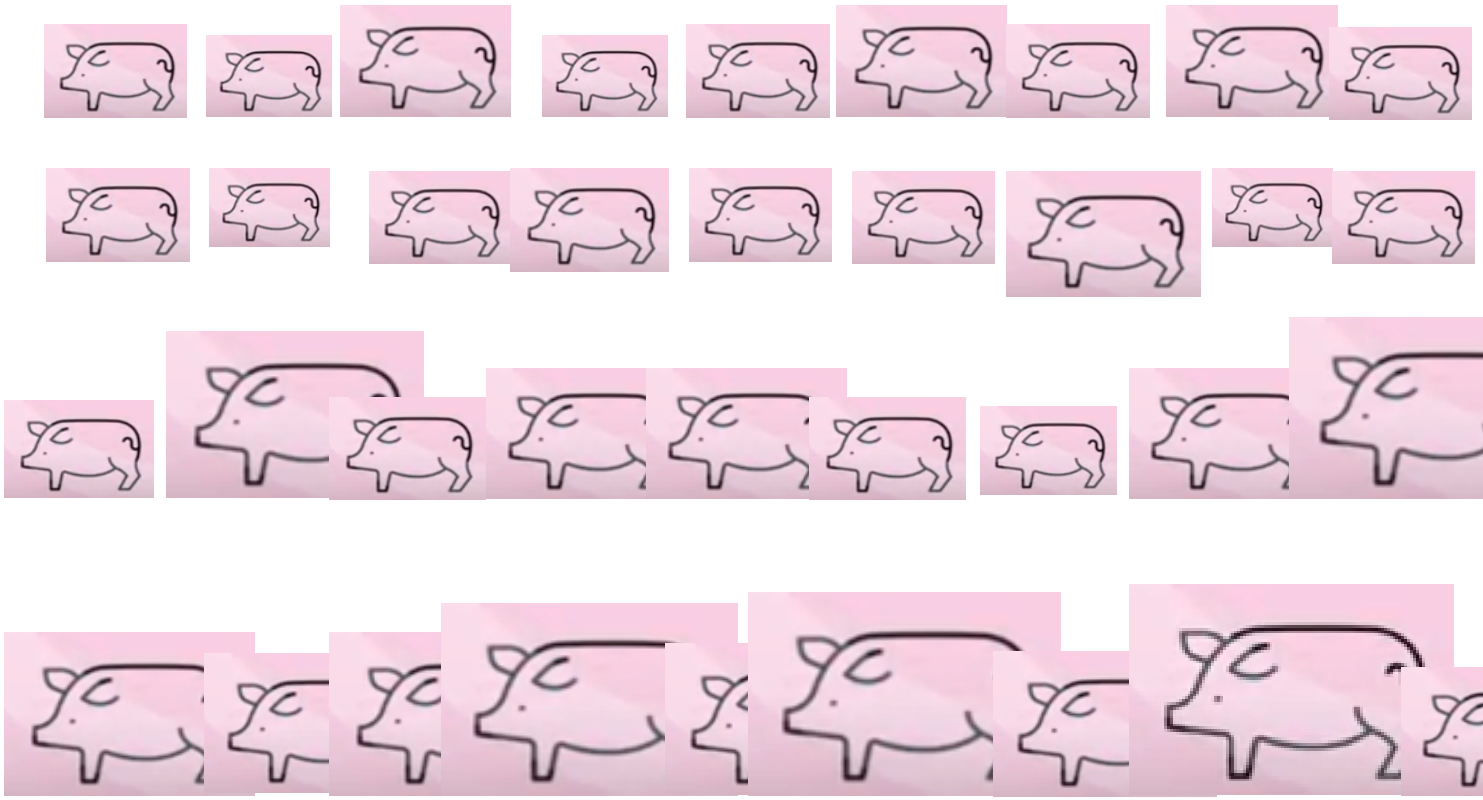
Material and methods

Welfare issue and sensor effect

Welfare problem	Tail biting	Respiratory disease	Pen fouling
Initial probability 	0.1-0.5	0.1-0.5	0.1-0.5
Spread	Low	Average	High
Spread reduction 	0-80%	0-80%	0-80%

Material and methods

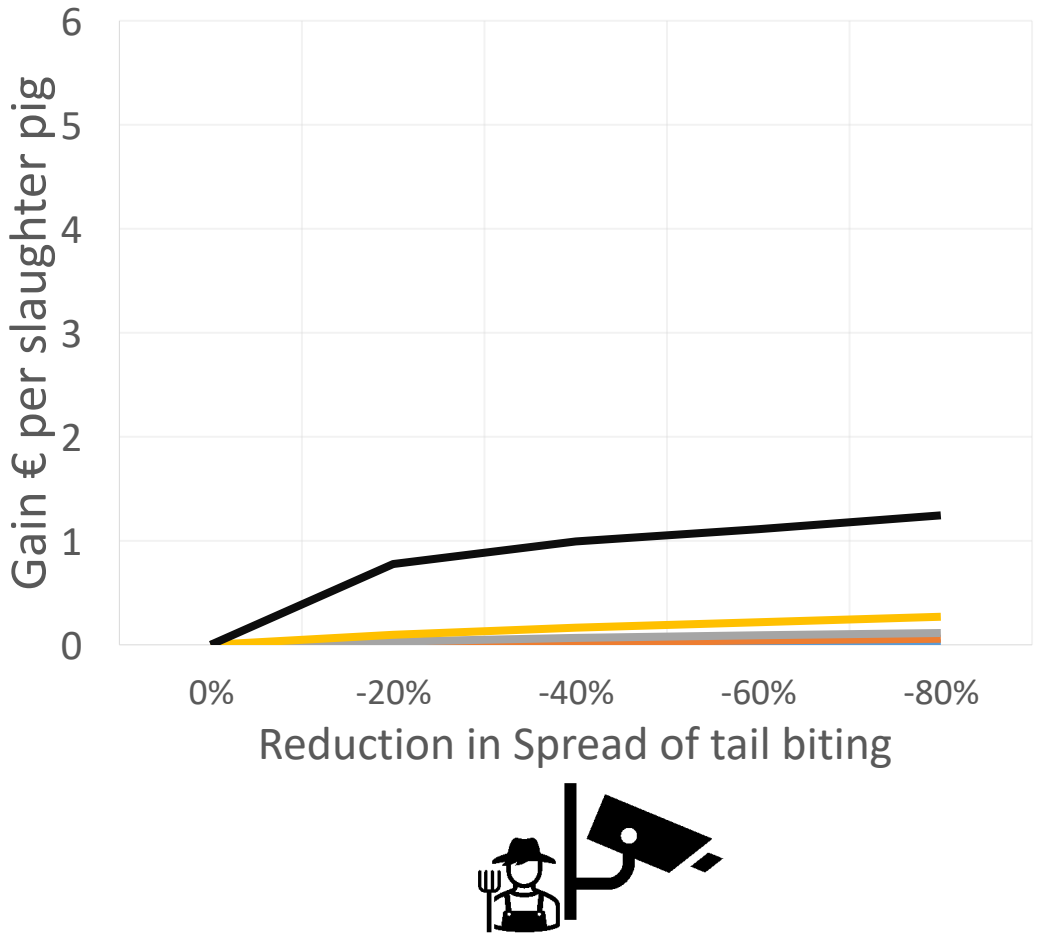
Modelling technique



$$V_1(\mathbf{x}_1) = E\left(\max_{\mathbf{u}_t(\mathbf{x}_t)} \left\{R_t(\mathbf{x}_t, \mathbf{u}_t) + \beta V_{t+1}(\mathbf{x}_{t+1})\right\}\right) \text{ for } t = 1, \ldots, T$$

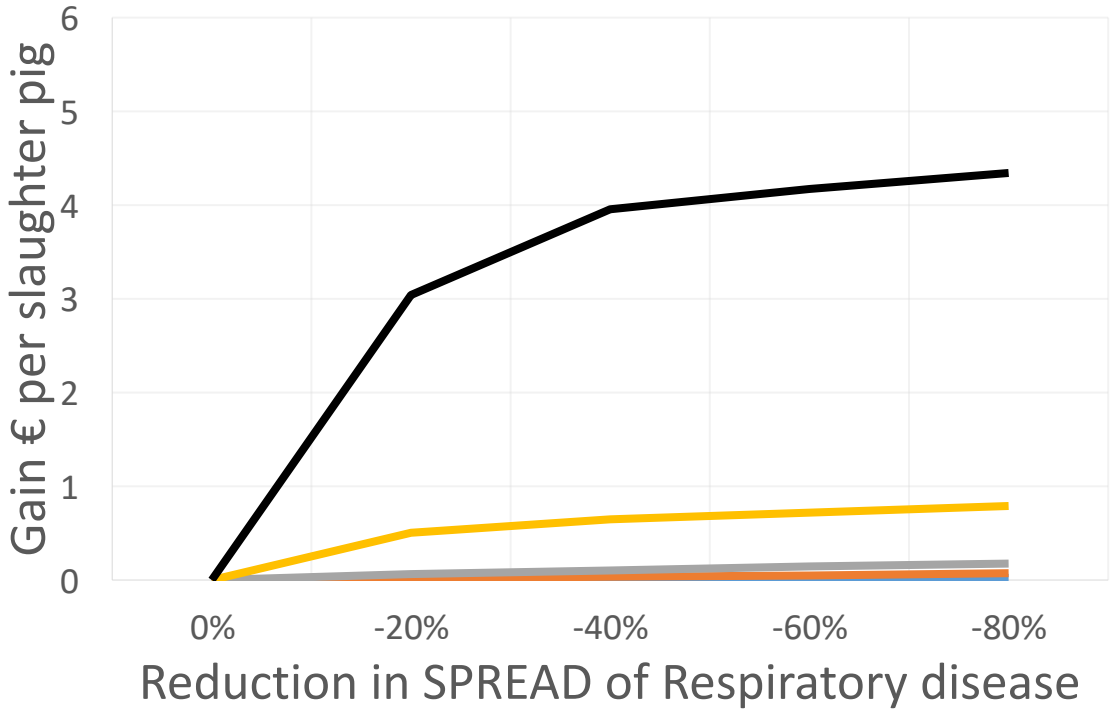
Results - Tail biting

How much farmer benefits from applying sensor technology in detecting tail biting?



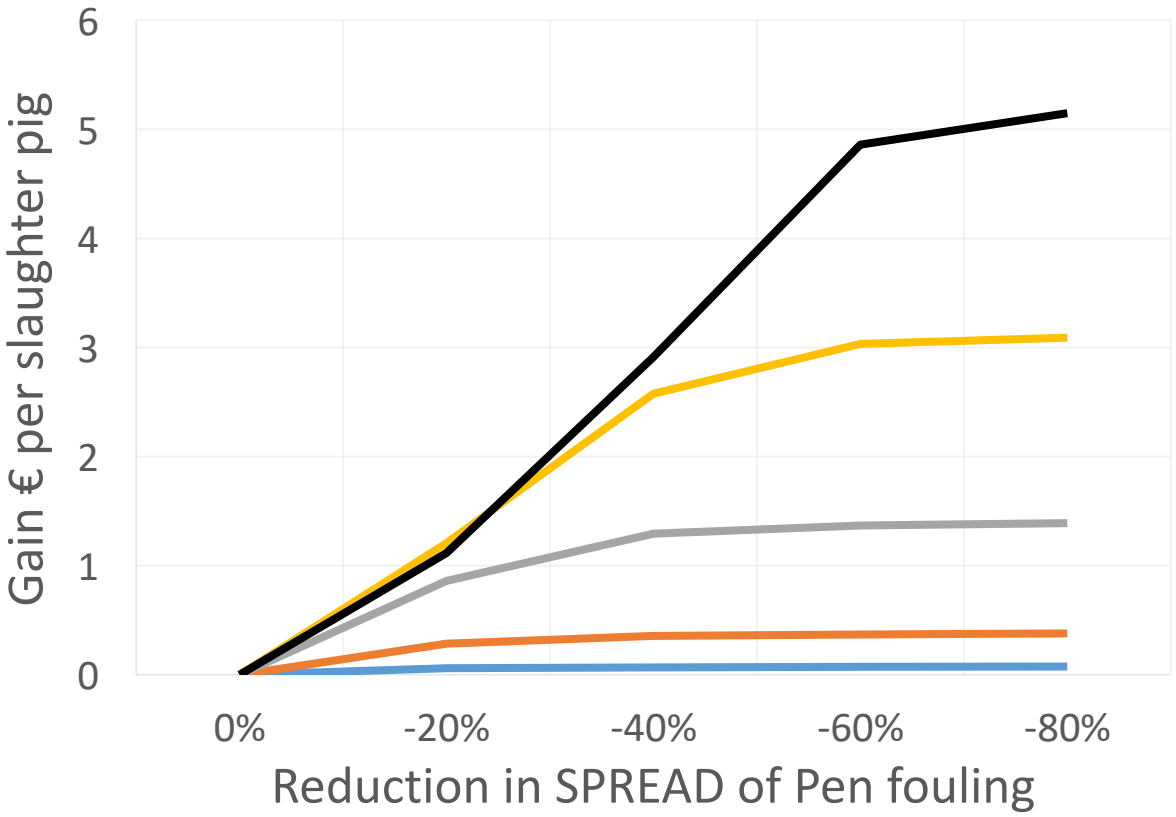
Results - Respiratory disease

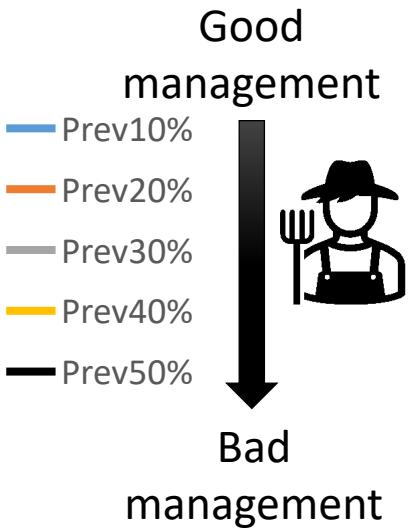
How much farmer benefits from applying sensor technology in detecting respiratory disease?

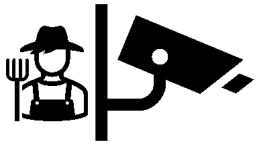


Results - Pen fouling

How much farmer benefits from applying sensor technology in detecting pen fouling?







Conclusions

1) Sensors can be economically efficient, especially when rate of spread of unwanted behaviours or pathogens is high, as in case of pen fouling
2) The recommendation of application of technology becomes questionable in farms with persistent welfare issues
3) Our model for disease spread and effect of sensor application has various assumptions and is based on literature - still more analyses is needed to provide general conclusions

Thank you for your attention!

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